San Juan Yachting

“Hele Mai”

A 46' Defever Ocean Trawler

Operating Manual

Edition of April 7, 2011

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Warning!

This notice is a part of this manual, and is placed here to warn you as an owner, crew member or passenger on this vessel that the author of this manual assumes no responsibility for any errors or omissions herein, and represents only that the writings and illustrations herein represent his "best efforts" to provide a comprehensive overview of the vessel, so that it can be operated by a person who has the necessary experience and/or training to operate such a vessel given the additional information herein.

You should be aware that this operating manual is provided as a convenience to the owner(s), crew members and passengers on this vessel, and is not complete in every detail. Given the complexity of this boat and its systems, there is no way that all conditions, contingencies, and operating details can be covered, both because of space limitations and because of ordinary oversight as contingencies are speculated upon by the author. Likewise, it is possible either through oversight and/or changes in the vessel as a result of additions, modifications, or deletions to or of equipment since publication of this manual, that items discussed will operate differently than described, be absent from the vessel, or be added to the vessel without discussion in this volume.

As a vessel owner, crew member or passenger on this vessel, you are here at your own risk, and the author of this manual has no responsibility for your actions whatsoever. If you do not feel competent to undertake any or all operations detailed herein, do not undertake it/them; get help from a competent person.

I thank you, (and my lawyer thanks you.)

Joseph D. Coons

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About the Author

Joe Coons is a retired AM-FM broadcasting station owner and computer systems corporate executive who throughout his life was involved in communications and mechanical, electrical, and electronic systems. He cruised his own boat on the Hudson River and Lake Champlain when a teen and in his early twenties, and during the 70's and 80's accumulated some 2,500 hours as an instrument-rated private pilot. Beginning in 1986 he became seriously involved in boating as a boat owner, subsequently working in a "retirement career" as a broker, also commissioning vessels, operating a charter fleet, checking out boat charterers, and training new power boaters. He has held a 50-ton Coast Guard Master's license, and operated his own boats and a substantial number of others from 26 to 70 feet in the near-coastal waters of Washington State, British Columbia, and Alaska. His "helm time" exceeds 8,000 hours. In addition, he has trained hundreds of boaters in the skills of vessel operation.

Section 1: Introduction & General Boat Description

1A: About This Manual

1A1: Manual Objective and Limitations

This manual is intended to introduce you to “Hele Mai”, its systems, and features, allowing you to operate it with the confidence and self-assurance necessary to enjoy your cruising vacation to its fullest. It is not intended to replace a basic understanding of seamanship, including navigation skills, weather interpretation or boat handling. You are expected to have an understanding of these subjects obtained through other sources, including training, seminars, reading and perhaps most important, experience.

There is no way that a small manual like this one can answer every question or give you a solution to every circumstance, foreseen or unforeseen. If you have a question which limits your understanding or handling of this vessel, ask the owner, a specialist, or contact Keith Robertson or Craig Cooper; make a list of questions as you read the manual, saving them all up to ask at one time).

1A2: How the Manual is Organized

The manual is divided into six sections numbered “1" to “6" plus an index (Section 7). Within each section are subsections lettered “A” to “Z” as required.

In section 4, which deals with the specific information about the vessel’s equipment and systems, the manual is organized by major categories, such as “Anchor”, “Dinghy, Davit & Outboard”, “Fresh Water System”, etc.

> *Note that within “Electrical Systems” are the “AC Electrical System” and “DC Electrical System” as sub-categories, and within them are such items that are a part of each, such as “Inverter”, “Generator”, etc.*; *Likewise, all electronic equipment is in the “Electronics” section.*

A complete index is at the back of the manual in Section 7.

1B: General Description of this Vessel

1B1: Exterior

General

Side view of Hele Mai

The Defever 46' Trawler is a traditional design, with fiberglass hull, cabin, flybridge, deck and swim step structures, teak gunwhale caps, and stainless steel welded fittings and handrails. The window frames are of aluminum with sliding glass panes, while the windshield frames are of the same material. For additional speed and stability, the boat also has been fitted with a bulbous bow.

The flybridge overhangs the side decks to provide protection from inclement weather. A roomy cockpit section with a storage lazarette beneath is especially useful for handling the dinghy after it is launched from its davit. The overhang created by the boat deck extending aft of the flybridge provides a roomy "veranda" for the boat that is especially welcome on hot days, or when entertaining with the aft saloon door is open.

The starboard aft side deck. Note fender camcleat.

Of particular note are the easy walk-around decks on each side of the vessel, enabling safe, secure passage around the boat by passengers and crew. Under the overhang in the cockpit to port a utility cabinet houses an icemaker for entertaining.

There are bulwark doors on each side of the boat. *These doors should be closed when docking or rafting, as they overhang the boat's side!*

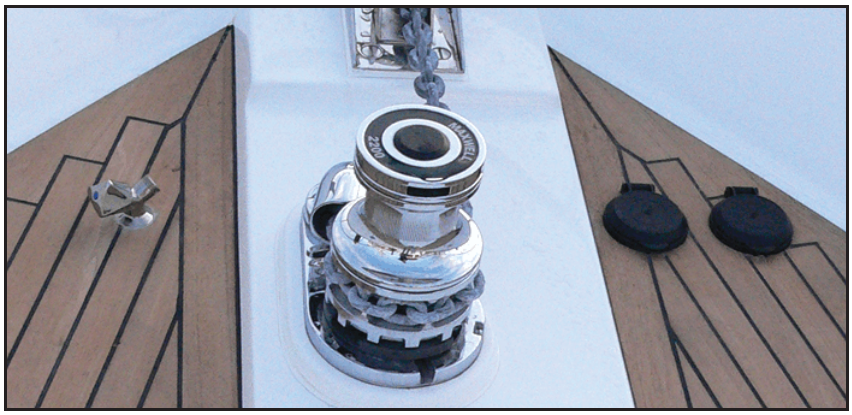
The owner has thoughtfully provided special securing-points for the vessel fenders, with cam-cleats allowing accurate bumper placement above the waterline.

On the side decks are four deck plates/fills, including two fills port and starboard on side decks for Diesel fuel; an additional two Diesel fills are in the cockpit for a total of six.

See note on page 4.32 re use of lazarette fuel tanks!

Left: The cockpit cabinet. It has an icemaker inside. Above: Swim shower, fresh water faucet and Cablemaster switch in cockpit.

On the foredeck there is a water fill deck plate, while to starboard is the waste pumpout deck plate.



(Above) The anchor windlass is forward, with foot switches controlling it to its right. Just left of the windlass is the seawater washdown faucet.
(Right) In this view you can see the mooring bit and the water fill (far right in photo).

The front of the Portuguese bridge. Washdown faucet and pressure inlet to left, shore power connections to right. Note also the hawse pipe with cleat and fender camcleat.

Forward on the bow deck is the anchor windlass with foot switches allowing chain movement both "up" and "down" electrically. The anchor retracts into the pulpit which hangs over the bow to give better clearance from the hull than otherwise possible. After passing over the winch, the chain goes below decks via a hawse pipe in the foredeck.

A fresh water faucet is on the front of the Portuguese bridge and a salt water washdown faucet is by the anchor windlass by the bow pulpit. There are coil hoses for each, a sturdy mooring bit; a water fill inlet to right of the mooring bit, and bow cleats built into the hawse pipes. The boat is fitted with a Maxwell VMC-2200 windlass that operates the main anchor with its chain.

The anchoring process for the anchor is expedited using the windlass controls at each helm station. The anchor rode is marked to inform the skipper how much chain is deployed.

There is a “Cablemaster” shore power cord at the swim step, and forward is a shore power connection (and an unused TV and phone socket) at the bow; these are selected by a switch in the electric panel; when power is to be disconnected, the ship AC power circuit breaker should first be turned to the "off" position to avoid arcing which could damage the plug contacts. The boat's shore power cable stays with the boat when away from its home dock. See “AC Electrical Systems” below for shore power requirements.

Flybridge:

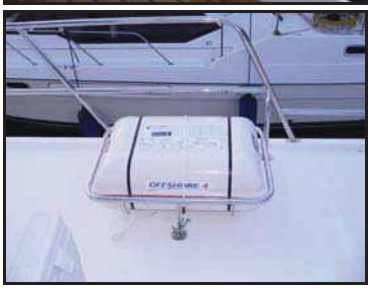
Above the saloon via the inside staircase steps from the pilothouse is the large flying bridge. At the aft end a windlass on the boat's davit above the dinghy deck area allows the boom and line to lift the 12-foot A-B RIB tender with a 40-horsepower Tohatsu electric-start outboard.

Above: The dinghy on the flybridge. It is launched using the crane to right.
Left: The flybridge settee seats four plus the helm seat.

Forward of the boat deck the flybridge has a stainless barbecue and an L-settee to starboard of the mast with under-seat storage (including a fire extinguisher). In the settee's forward compartment are the dual propane tanks for operation of the stove and barbecue.

Fully forward on the flybridge is the helm structure, with substantial room for engine controls and instruments plus the ship's full complement of electronics. To port forward on the flybridge a half-door with sliding hatch above accesses the pilothouse stairway. The door and hatch are secured both open and closed by sturdy hardware.

A Bimini top covers the flybridge seating area making it a wonderful, shaded area; of course, the top can be lowered when weather permits.



Above: The flybridge console carries a full complement of electronics.
Left: Access to the pilothouse is through the double-door hatch.
Far left top: Propane tanks and storage is beneath the flybridge settee.
Far left bottom: the flybridge carries the emergency life raft.

Lazarette

The lazarette beneath the cockpit is accessed via a large, deck strong hatch in the cockpit. It holds the furnace and steering gear, as well as providing storage space for other items.

The lazarette hatch. Note the steps and teak flooring in picture.

Looking to port inside the lazarette. Rudder gear is under the raised section of the floor to left. Pipes & valves on the far wall (the boat's hull to port) are the rudder hydraulic system, and you can see the autopilot pump.

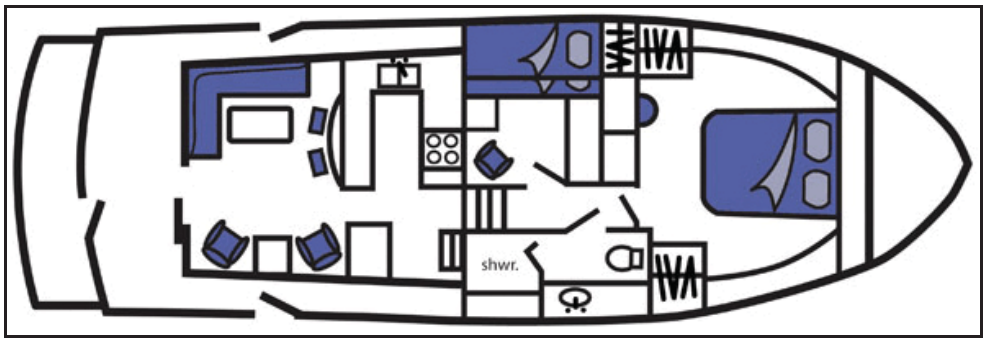
To starboard aft in the lazarette is the Diesel furnace system. The exhaust pipe is wrapped in protective insulation. Because of fire risk, do not store anything in this area! See picture below...

Two 50-gallon tanks are in the lazarette, neatly plumbed with sight tank level gauges.

Between the tanks forward is one of the boat's bilge pumps. Note the neat wiring arrangement.

This picture shows the net installed to keep material away from the furnace!

1B2: Main Deck



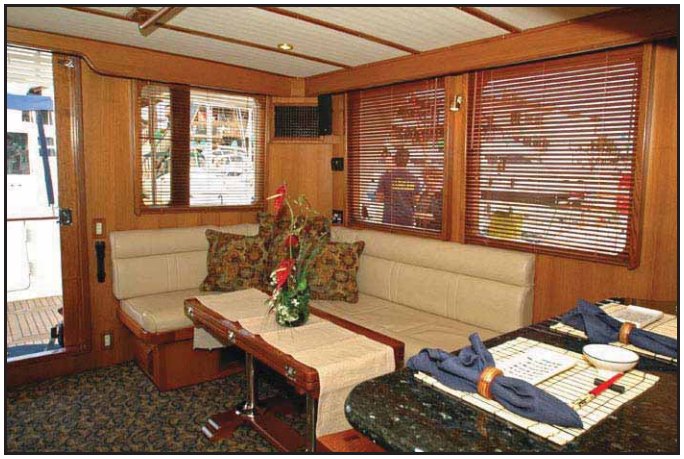
Main & Lower Deck Floor Plan

Saloon:

The boat is entered by either of three doors.

Port and starboard side doors are on the pilothouse (they should be closed when underway except at very low speeds in calm waters to avoid getting salt water inside the doorways). The main entry access is the large door at the aft end of the saloon, which opens onto the cockpit level; with its window and especially when open, it makes the saloon a bright, airy and pleasant place.

Starboard side of saloon, looking aft. Note the TV cabinet & recliners.

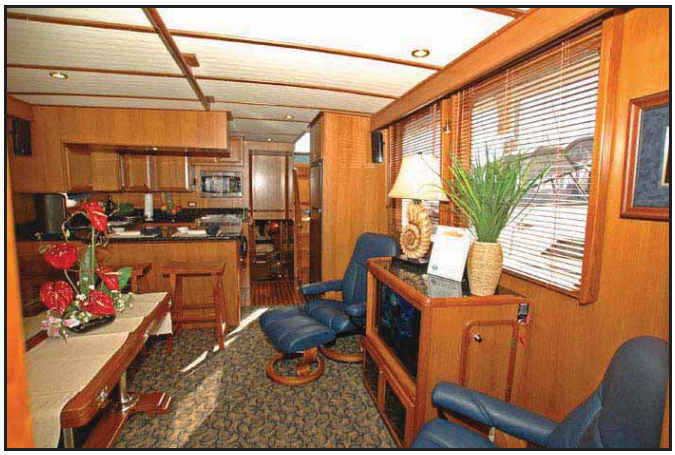


Port side of saloon, looking aft. Table opens up for dining at L-settee.

From the cockpit door you are in the beautiful saloon. To port an L-settee seats up to four; it has a cocktail/dining table in front. The table can be easily opened and expanded to make it more spacious for dining as in the photos.

Across from this settee are two reclining chairs with a storage cabinet between that also holds the flat-screen TV and electronic entertainment equipment.

Although the furnishings here appear entirely for comfort, there are important utilitarian features. Under both ends of the settee are drawers for storage, and under the central part of the settee's "L" is the air conditioning air handler for the salon.



Forward to port past the end of the settee in the saloon is the galley. Note that the counter serves as a bar with stools.

The galley has counters, sink, stove, microwave, & compactor in an "L" arrangement.

Galley:

The ship's galley is just forward of the saloon area. It includes all that the chef could require including, of course, range, refrigerator-freezer, microwave/convection oven, garbage disposer, and extraordinary storage making the necessities for long cruises easily kept and quickly accessible.

The boat is fully equipped with utensils, dishware, and cookware, plus the "little touches" of place mats, etc.

From the galley the crew easily serves both the pilothouse for en route dining, as well as the saloon and its main table, yet the cooking can be discreetly obscured from view by the divider making guests more comfortable; and there is adequate space for two cooks to work in the galley.

Another view of the stove and microwave.

In addition to the storage and facilities directly in the galley "U", the double door refrigerator-freezer is across from it in the forward end of the saloon settee.

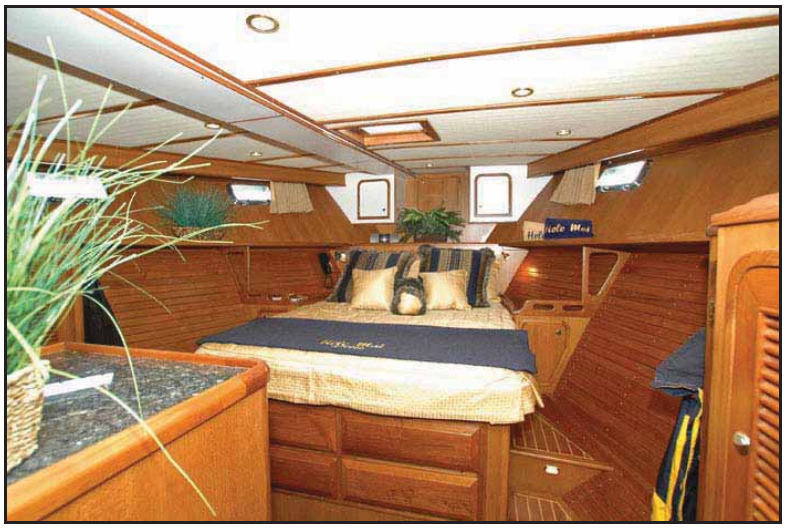
The sink is fitted with a garbage disposal activated by a button on the right top corner of the sink.

Across from the galley is this roomy refrigerator/freezer.

1B3: Stateroom (Lower) Deck:

This area of the boat is accessed via the stairway from the saloon.

M/S/R vanity, dressers & hanging lockers, port.



Master stateroom. Note drawers under berth, hanging locker to starboard.

Master Stateroom:

The master stateroom suite is located forward for maximum space and comfort. The island queen berth is slightly elevated with steps upon each side. Aft of these steps are hanging lockers on each side, and on the aft stateroom bulkhead there is a dressing table and dresser with a swing-out seat.

The head compartment.

Depth and wind instruments keep the skipper advised of the ship's status at anchor.

There are drawers under the berth's foot. Under the berth, the mattress panels lift out to reveal the bow thruster and its battery.

Above the head of the port side of the berth, there is an intercom phone and a remote control for the ship's Westerbeke generator.

Head Compartment:

The head compartment to starboard of the companionway serves both staterooms, and has a separate stall shower. It has a granite-topped counter with storage plus, of course, a toilet, basin, and roomy shower compartment. There is lots of lighting and an exhaust fan is provided for ventilation in addition to the porthole. A Y-valve is under the floor in the guest stateroom (see "Heads" section, page 4.42).

Above: The shower stall
Right: The head compartment has water & holding tank gauges.

Guest Stateroom:

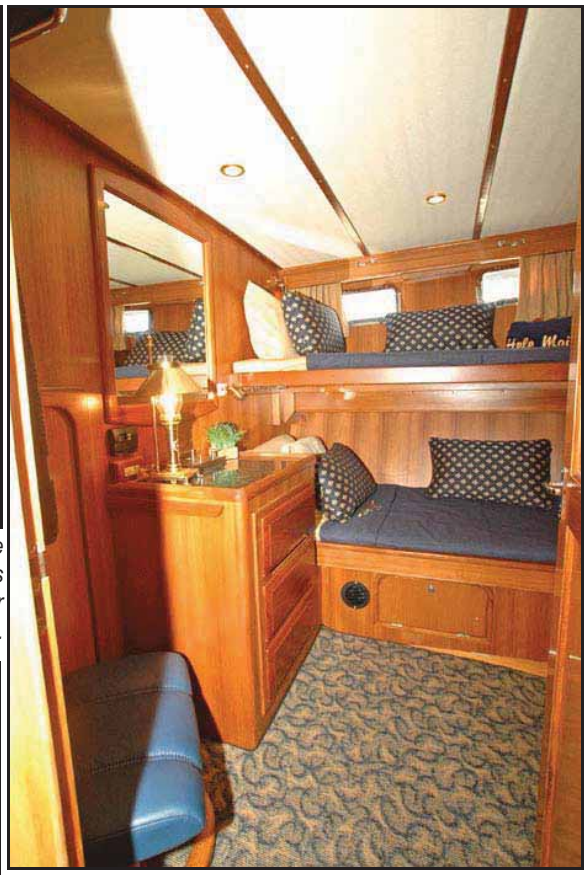
Your guests deserve comfort, too, and Hele Mai doesn't scrimp for your VIP guests aboard. The guest stateroom is to port at the foot of the companionway steps opposite the head compartment. There is a hanging locker with extra storage above and below, and there's a door for storage access under the lower berth. Good lighting adds to the comfort.

When guests are not using the berths, they convert to a settee. The upper berth swings down and supporting hardware secures in a near-vertical comfortable position.

The boat's washer-dryer is also in this compartment.

In this photo you can see one of the barrel bolts holding the berth up, as well as the alternate position for making it a seat back.

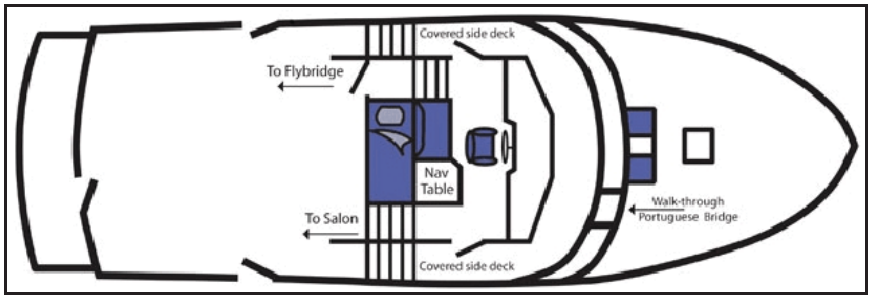
Lots of creature comforts...



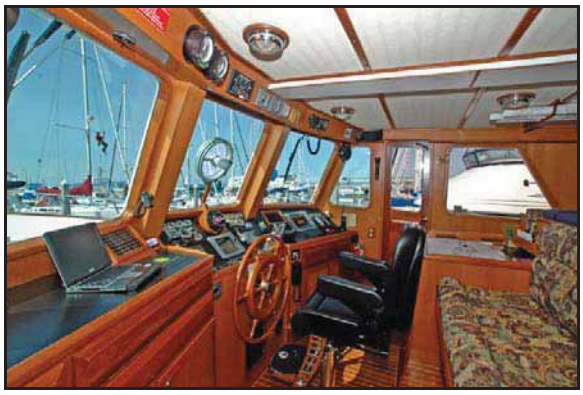
Part of the guest stateroom. Note reading lamps and intercom phone.

The washer-dryer is under the hanging locker. (Floor is now carpeted.)

1B4: Pilothouse Deck



As you saw in the floor plan, the saloon and pilothouse are separated from one another by three steps. The pilothouse is accessed from either side deck door, the steps from the saloon, or the steps from the flybridge, and is the nerve center of the boat. The helm offers the skipper a ringside seat in front of the remarkably-well-equipped lower helm station, and a commanding 180-degree view of the boat's direction and surroundings for easy, comfortable operation in inclement weather. Just aft of this is a settee lounge that seats the skipper and two crew as pilothouse guests.



The impressive pilothouse panel is the boat's nerve center.

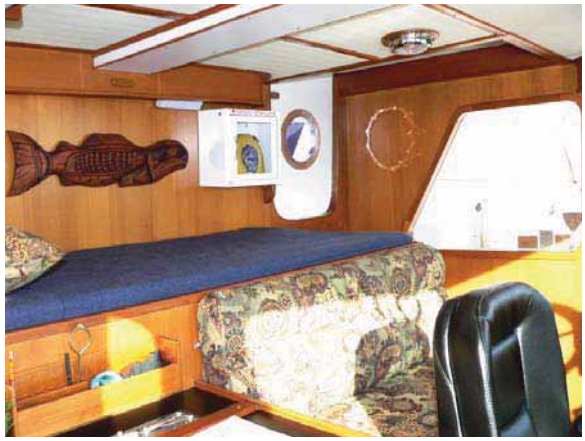
A table in front of the settee can be used for navigation and/or food service when eating underway. Above this lounge a pilot berth provides nearby accommodation for a standby crewperson.

There are cabinets on each side of the steps to the pilothouse from the saloon.

P/H to stbd: steps down to the saloon and a roomy cabinet.

The helm itself has an extensive equipment list including but not limited to main engine controls and instruments, navigation electronics including two large LCD displays with autopilot (with a remote control so the skipper can run from the settee), anchor windlass controls; stabilizer control, VHF radio; depth sounder, fresh water usage counter, and large, clear and complete electrical system switching and monitoring controls and systems. No reasonable detail has been overlooked that could assist the captain in the vessel's safe and efficient operation.

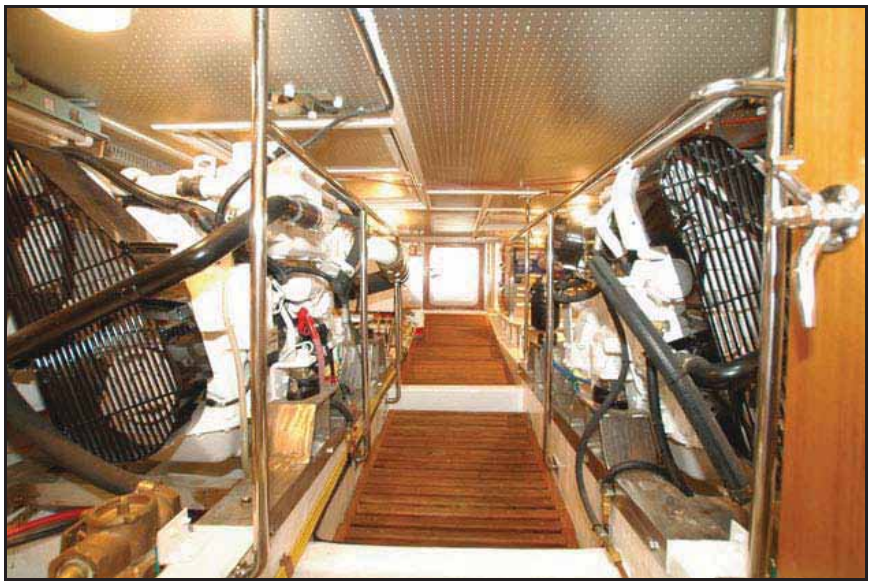
To port in the pilothouse are the steps leading up to the flying bridge providing quick and secure access for crew to this alternate operating area and prime relaxation spot. Courtesy lights on the face of each stairway's risers make access at night safe with glare for the helmsperson. The defibrillator is by these steps.



Pilothouse to port: defibrillator, storage and flying bridge steps.

1B5: Engine Room

Breakers (third from the bottom, left row and third from the top, middle row) in the ship's DC power panel on the port side of the helm, and switches inside and to the left of the door from the companionway to the engine room turn on the engine room lighting.



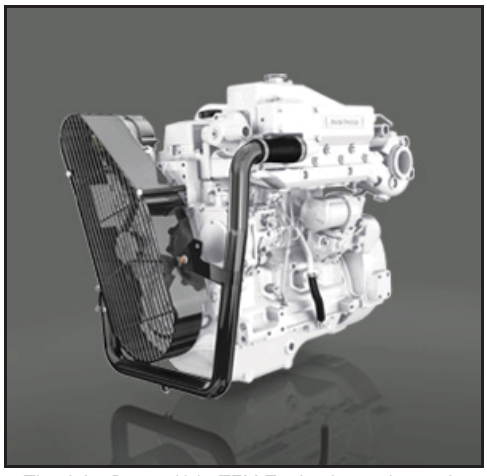
Looking from the forward end of the engine room to aft. Engines in the foreground, door to lazarette in distance.

The engine room aboard Hele Mai is accessed from the aft end of the guest stateroom. There is adequate headroom to allow easy access throughout, and space is sufficient to get around the main engines.

Guest stateroom's door to engine room.

The twin, turbocharged John Deere four-stroke Diesel engines develop 135 horsepower each (maximum) and drive the vessel via standard shaft arrangements on each side of the vessel's centerline. The engine starting and house batteries are outboard and aft of each engine. The port engine has the stabilizers' hydraulic pump.

Among the numerous units and systems in the engine room are Flo-Jet fresh and sea water pumps, an oil-change system, fuel manifold, sight gauges on the fuel tanks, dual fuel filters for the main engines and a single filter for the genset, a hot water heater, dripless shaft seals, starting, generator and house batteries, sea valves, sea water strainers, and the watermaker.



The John Deere 4045 TFM Engine is a quiet modern, fuel-efficient design.

At the aft end of the engine room is a Westerbeke generator yielding 10,000 watts of 230/120 volts AC.

Fuel for the engines and generator is 800 gallons in six tanks, 400 per side in a 50 gallon lazarette tank, a 100 gallon engine room aft tank, and a 250 gallon engine room forward tank. A fuel manifold permits tank selection to use fuel as desired as well as provide for trimming the vessel *(see "Fuel System" , 4.32 for a discussion of fuel management.)*

This is truly a professional engine room up to the high standard of the vessel!

1B6: Dinghy & Davit

The boat is equipped with a 12-foot, center console A-B tender which is a rigid-Hull, inflatable-pontoon boat and is fitted with a Tohatsu 40 horsepower two-cycle electric start-and-tilt outboard motor and portable fuel tank. For environmental considerations and easy fueling, the motor uses direct oil injection; **you do <u>not</u> mix oil with the fuel, but you should be sure the lube oil tank on the front of the engine is topped off before use.**

Davit control in cabinet.

The A-B dinghy on its chocks on the aft flybridge deck. The davit is to right.

The dinghy has a fixed center wheel and upholstered aft seat and removable forward seat. It is equipped with an electric bilge pump, built-in fuel tank, automatic bilge pump, trim tabs, VHF, and Fish Finder.

The davit system uses a stainless steel mast to hoist the dinghy, using a hoist winch operated by a control that plugs in when needed. The control is stowed in the helm console cabinet to port of the helm. The battery switch located under the aft saloon seat must be on.

See 4.5, paragraph2 regarding water in the dinghy's bilge!

The davit main switch is in the aft saloon settee "L" facia.

1B7: Deck Equipment

The boat has mooring lines; a stern/shore line at least 600' long on a reel in the lazarette; a 55-pound Delta fast-set stainless main anchor with a 600' all-chain rode (with 350' marked); a fortress FX-37 emergency anchor with 40' of chain and a rope rode stored in the starboard lazarette, an anchor bridle stowed in the Portuguese bridge cabinet; bridles for shackling to a mooring buoy; a boat hook, a boat hook-attached buoy-hooking device; fenders/bumpers; and a hose for fresh water tank filling and boat washing.

1B8: Safety Equipment

Life jackets are in cabinet.

Life Jackets and flares are in the pilothouse in the cabinet under the settee just behind the helm seat; more jackets are in a bag in the lazarette.

This vessel is equipped with *fire extinguishers* located:

- By the engine room door inside to starboard;
- In the saloon above the refrigerator;
- In the pilothouse by the starboard door;
- In the master stateroom inside the forward starboard hanging locker
- On the flybridge inside the aft seat.

Fire suppression system control handle.

There is an *automatic fire suppression system* in the engine room that can be manually operated by pulling a handle on the aft side of the TV/Stereo cabinet in the saloon.

There is a *First Aid Kit* in the head compartment cabinet.

There are *Carbon Monoxide Monitors* and in the master stateroom forward and on the aft side of the entertainment cabinet.

There are VHF Radios at both helms and there are handheld VHF radios aboard;

The Lifesling is just to stbd of the transom door. Instructions are on front of the bag.

A *Lifesling* rescue system is in the cockpit just to starboard of the transom door;

An *Emergency Life Raft* is starboard on the flybridge just forward of the dinghy;

High Water Alarms check each bilge. See page 4.4.

A *FLIR* Navigator II thermal imaging system to allow for nighttime visibility.

The Life Raft. Instructions are atop it.

A *Defibrillator* is located above the pilothouse berth by the door to the flybridge.

The emergency defibrillator in the pilothouse by the flybridge steps.

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Section 2: Important Vessel Numbers

Vessel Name: Hele Mai

Vessel Official Number: 1207966

Hull ID Number POC46117L708

Capacities:

Sleeps four/five:	Two in each stateroom (plus pilot berth if desired)
Fuel:	800 Gallons in six tanks
Fresh water:	250 Gallons in one tank under master stateroom
Holding Tank:	50 Gallons

Dimensions:

Length Overall:	46 feet
Beam:	15 feet
Draft:	5 feet 6 inches
Displacement:	42,000 Pounds full load

Fluids:

Motor Fuel:	#2 Diesel
Motor Oil, mains:	15W-40 Chevron Delo Multigrade
Transmission Oil:	30-weight Chevron Delo
Engine Coolant:	50-50 mix, ethylene glycol & water; corrosion inhibitor added (Supply on boat already mixed)

Operating Parameters (Estimated): *Actual consumption will likely be **less.***

RPM	***Speed***	***Total Fuel Consumption***	***Naut. Miles/Gallon***
1400	6.5	2.8	2.32
1600	7.2	3.6	2.0
1800	8.2	4.2	1.95
2000	9.1	6.5	1.40
2200	9.5	9.5	1.00
2400*	9.9	12.0	.83
2600*	10.5	14.0	.75

* *Speeds over 2340 RPM are limited to no more than 20% of operations (no more than one hour in five.)* ***No exceptions!***

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Section 3: Checklists & Maneuvering Suggestions

First Thing Each Day

- ☐ Check engine oil, coolant.
- ☐ Check under-engine oil pads. Okay?
- ☐ Check fuel tank levels, fuel valve settings
- ☐ Check holding tank indicator in head. Need pumping?
- ☐ Turn off anchor light if illuminated.

Starting Engines

- ☐ All lines clear of propeller and on deck.
- ☐ Items running on AC evaluated vis-a-vis the Inverter and Generator.
- ☐ Battery selector switch on “Both”. ☐ Appropriate DC breakers "On".
- ☐ Thruster breaker and Electronic Engine Control breaker "On".
- ☐ Shore Power/Generator switch to “Gen”
- ☐ **DC panel “Stabilizer” breaker must be “ON” before engine start!** *See 4.45.*
- ☐ Shift levers in “neutral/idle”.
- ☐ Lift control switch cover, press control selector switch. Neutral lamp “On”.
- ☐ Engine key switches "On".
- ☐ Push start buttons.
- ☐ If engines do not turn over, see “What to Do If”.
- ☐ Center stabilizers *see page 4.45.*

Leaving Dock (Only 3-4 minute engine warmup required!]

- ☐ **Aft Side deck bulwark doors closed!**
- ☐ Shore power switch “Off”.
- ☐ Shore power cord removed, stowed on board.
- ☐ Fenders hauled aboard and stowed.
- ☐ Lines and other deck gear secure/stowed.
- ☐ Doors and hatches closed and secured as appropriate.

Underway

- ☐ Helmsperson on watch at all times. ***To use stabilizers, see page 4.45.***
- ☐ RPM under 1400 until engines warm to 140°, extended RPM’s under 2350.
- ☐ Wake effects always in mind.

If Engines are to be Shutdown or Vessel will be Stopped or Reversed

- ☐ Press & hold “Center” on stabilizer control panel & confirm on bar graphs.

Approaching Dock

- ☐ Press & hold “Center” on stabilizer control panel & confirm on bar graphs.
- ☐ **Bulwark doors closed** & fenders out as appropriate.
- ☐ Bow line OUTSIDE stanchions and bloused around toward midships.
- ☐ Engine dead slow, thruster breakers “On” for maneuvering.
- ☐ Mate ready to secure stern first (in most circumstances).

After Arriving at Dock in Marina

- ☐ Aft bulwark doors may be opened if no risk of rolling damage.
- ☐ Lines secure, including spring lines.
- ☐ Water heater breaker off until Inverter current settles (see “Inverters” below).
- ☐ Shore power cord connected, shore power switch “On” to power location.
- ☐ Shore power confirmed on meters, Inverter “On”.
- ☐ Electric use monitored for current capacity of shore facilities.

Arriving at Mooring Buoy

- ☐ Press & hold “Center” on stabilizer control panel & confirm on bar graphs.
- ☐ Skipper puts starboard end of swim step, with mate on it, next to buoy.
- ☐ Mate loops 20' or so line, such as bow line, through buoy ring.
- ☐ Mate holds two ends together, walks up side of boat to bow of boat.
- ☐ With buoy held close to bow, line secured to each bow cleat through hawsepipe.

Mooring at Anchor

- ☐ Press & hold “Center” on stabilizer control panel & confirm on bar graphs.
- ☐ Anchor is lowered from pulpit while boat is backed up slowly away from anchor.
- ☐ When desired chain length out (4:1 or 5:1 scope), windlass is stopped.
- ☐ Engine reversed for “count of five” until chain pulls up virtually straight. Note: The boat is not held in reverse against a taught anchor chain!

Generator Starting/Stopping

- ☐ Hold “Preheat” switch for 15 seconds, then while holding...
- ☐ Hold “Start” switch until it starts (if it does not start, repeat “preheat” step)
- ☐ Check starboard side exhaust for water flow.
- ☐ After one minute for warmup, turn power selector from “Off” to “Gen”.
- ☐ Stopping: Turn power selector from “Gen” to “Off”, wait 1 minute for cool-down.
- ☐ Hold “Stop” switch until stopped.

Overnight Checklist in Marina

- ☐ **Aft bulwark doors closed** (lest boat should roll).
- ☐ Shore power “On”.
- ☐ Inverter “On”.

Overnight at Anchor or Buoy

- ☐ Anchor light “On”.
- ☐ DC electrical items all “Off” including radios, extra lights, etc.

Upon Arising

- ☐ If at anchor or buoy, Inverter only “On” if necessary.
- ☐ Start generator if necessary for battery charging.
- ☐ Inverter “On” if shore power available or generator running.
- ☐ Turn on heat if necessary.
- ☐ Go to top of this Hele Mai checklist.

3B: Maneuvering Suggestions

3B1: Docking & Undocking

Usually it's easier to dock bow in. Have your mate at the swim step, ready to step off and secure the stern line, against which you can pull to swing the bow in toward the dock. By having your mate ready to disembark when close to the dock, he/she will not have to jump to the dock, risking a turned ankle or falling overboard. It is the skipper's job to put the boat next to the dock so the mate needn't jump, but merely step off!

Port aft bulwark door by salon. The aft doors opening out requires caution!

Forward doors open in, so no problem! (These near the pilothouse each side)

Because the aft bulwark doors open out, there is a risk that they will be damaged:

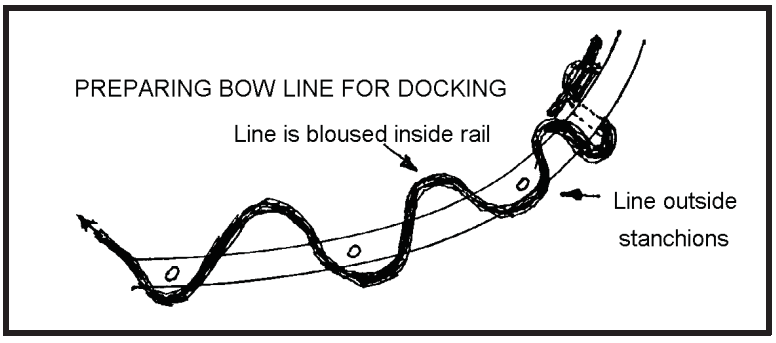
A. when the boat is approaching or leaving a dock;

B. when the boat is at a dock and is rolled by a wake; and

C. when the boat is rafted with another boat.

As a result, you should have the aft bulwark doors closed whenever approaching or leaving a dock, if there is <u>any</u> chance a wake will roll the boat when at a dock, or when rafted with another boat.

The <u>forward</u> bulwark doors by the pilothouse are not affected by this caution.



Approaching a dock, have fenders out as required and have the bow line already rigged, passed through its hawse pipe, and draped back on the side of the boat between the stanchions so it can be reached from the dock. Never put a line from a cleat over a rail: the boat's weight will damage the stanchion or break the rail if it pulls against the line! When the mate's ashore, the line can be easily reached!

If dock clearance permits, spring the boat forward so that it pulls forward on the stern line. This will bring the stern close to the dock. Let the bow line out enough so that the boat can rest against the stern and midships fenders.

3B2: Maneuvering in a Harbor

Because of its substantial weight, this boat is predictable! Take advantage of its momentum/inertia: you will find that if you maneuver slowly and thoughtfully you can maintain control at all times.

Before undertaking docking in a "tight" space, practice with the boat in open but protected water to get the "feel" of the boat. Don't let the skipper's ego get in the way of safe operation, and remember, if the slip is too tight you can always dock somewhere else! And don't forget the boat's overall length is approximately 50 feet! Operating from the flybridge is usually best until you are very familiar with the boat because of its much better visibility.

You should usually dock "bow in"; remember, the stern is what is turned by the rudder, so you should "point the bow where you want it" when entering a slip, then swing the stern as necessary. Remember, too, that the rudders are normally effective only when the props are going forward. Usually, it is best to center the rudder and use the engines to steer the vessel.

Finally, use the bow thruster sparingly and only as necessary (remember, thousands of fishermen run boats bigger than this one without thrusters and only one engine!) As you will read later in this manual, if used too much, more than a couple of minutes in a single docking session, a thruster can get hot enough to open its thermal overload relay and will then be inoperative for 10-15 minutes while cooling.

3B3: Anchoring

Anchoring can be accomplished safely with a minimum of fuss if you are prepared. Or, if you are not ready, it can be stressful and dangerous for you or the boat.

Before attempting to anchor, select an anchorage with a soft bottom such as sand, mud, or gravel, if possible. Look at the charts and cruising guides for tips on good locations. Then, choose the spot in the anchorage where you have room to “swing” on the anchor without disturbing other boats. Remember, responsibility for leaving room goes to each successive boat to arrive, for the first boat has priority in the anchorage!

Here in the Northwest, because of the deep waters, all-chain rodes and small bays, we anchor a little differently than in the Gulf of Mexico or Carribean, for example. First, except in severe weather we use anchor chain scopes of only 4-to-1 or 5-to-1. For example, in water that is 40 feet at low tide in the typical anchorage, we might use 160 feet of chain unless the weather was to be gale force or greater winds.

Second, because of the small bays and steep bottoms, we often rig a shore line from the stern of the boat to shore. The best example of this would be at Todd Inlet at Butchart Gardens: Here is a bay that can accommodate 8 - 10 boats, yet it is only about 150' wide and 200' long! Boats attach their bows to the mooring buoys or, in a few cases, anchor; and then their sterns are secured to rings provided in the steep cliffs overlooking the bay. Boats are thus perhaps only 15-20' apart, side to side.

Third, boats often will “raft” side by side in busy marinas, although this is not very common.

Fourth, courteous boaters will call vessels coming into busy bays and offer to let them raft to the same buoy, if signs on the buoys do not limit usage to only one boat depending upon length.

Anchoring safely requires two persons, one at the helm maneuvering the boat and one on the bow operating the anchor. Putting the bow of the boat over the spot where the anchor is to be placed after checking the depth on the depth sounder, the windlass foot-switches are used to lower the anchor slowly toward (but not onto) the bottom, by watching the chain markings, which are painted **every 25' on the anchor chain.**

When the anchor is about to reach bottom, the boat is backed away by putting the engines into reverse for 5 seconds: eddies from the chain indicate motion. Resume lowering the anchor while drifting backwards (watch the eddies and add another burst or reverse if necessary!) until the desired amount of chain is out. Stop paying out chain. Engage reverse for five seconds at a time until the chain starts to pull straight off the bow toward the anchor. A straight chain indicates a “set” anchor!

NEVER pull on the chain for more than five seconds, and never at any engine RPM other than idle! Putting the boat’s weight plus its horsepower on the chain forcefully even at idle will bend the anchor and/or damage the mooring gear!

If while checking the set, the chain rumbles and clunks, and seems to release in bursts, it means you're anchoring on a rocky bottom and the anchor is not holding. Be patient: it may not set on the first try, and you'll have to repeat the process sometimes to get a good “set”.

3B4: Anchor Bridle:

An anchor bridle is located in the Portuguese bridge cabinets. Use it when anchoring overnight, as it accomplishes three goals:

(A) It takes the strain of the anchor off the windlass, pulpit, and pulpit pulley and directs it to the bow cleats which are more suited to hold it;

(B) It reduces substantially the “chain noise” transmitted to the occupants of the forward cabin;

(C) It allows the anchor rode to have a lower angle relative to the sea bottom, thus increasing the anchor’s holding power.

To use the bridle:

(1) Lower the anchor normally then, after it is set, hook the bridle on the chain just in front of the anchor pulpit bow roller.

(2) Secure the bridle rope ends through the side-coaming hawse pipes, to the bow cleat on each side so the bridle lines are equal in length and as long as possible.

(3)Finally, operate the windlass to pay out anchor chain so the chain slacks and is supported by the bridle, the chain forming a loop right in front of the boat’s bow.

If you wish, you can pay out additional chain to form a long hanging loop between the boat and bridle, which weights the chain down in front of the boat well below its normal path; thus the chain itself becomes a “kellet” or “sentinel”, lowering the chain angle more than the bridle alone. The weight “drooping” the chain down like this then forms a an even more effective “snubber”, so the boat is gently held against the pressures if wind and tide.

3B5: Shore Lines

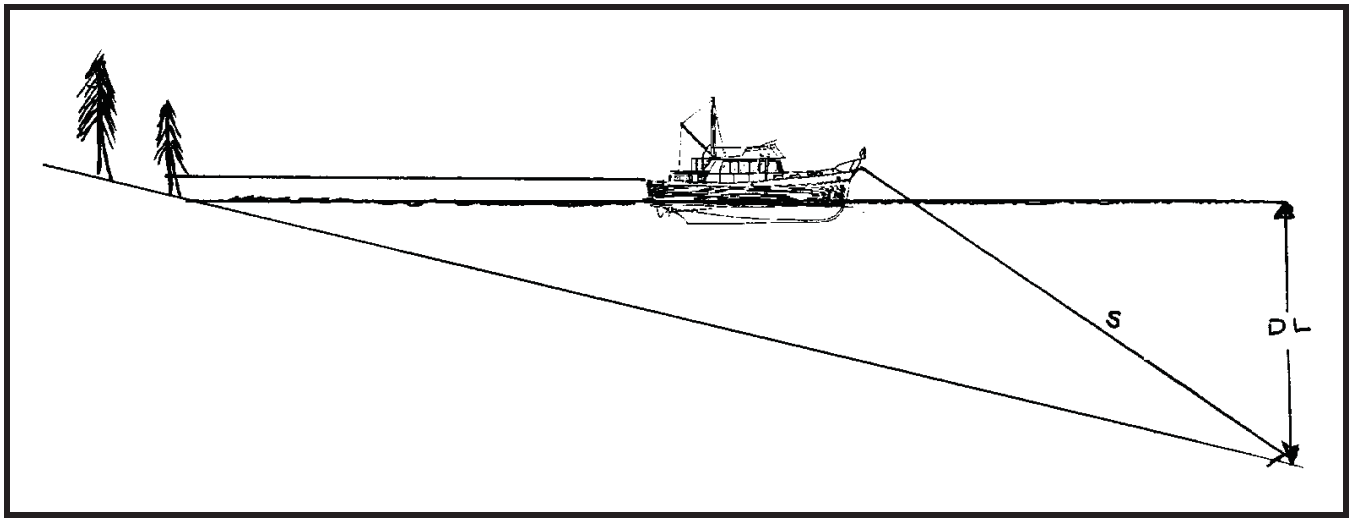
When a shore line is required, the anchor is set 75 - 100 feet from shore, with the boat backing toward shore during anchor-setting. The stern line is put around a tree, and brought back to the boat. During this process, be sure to keep clear of rocks near the shore, and allow for our Northwest tides, occasionally twelve feet, and sometimes 20 feet when further north! Check the present tide, and high and low tides before beginning anchoring: No sense anchoring in 15 feet of water if you're at the "top" of a 15 foot tide!

To get to the shore, you will need to have a dinghy down, and then have your mate keep the boat's stern toward shore with short bursts of reverse gear. Sometimes a helpful

boater already anchored will help you by taking your line to shore for you with his dinghy, a neat "good deed" that you might reciprocate. We've met some nice boaters this way!

The shore line is in the lazarette, and is long enough to usually allow taking it to a tree, around it, and back to the boat so you don't have to go ashore to untie when leaving. With a crew member keeping the boat in position, take the dinghy to shore pulling the end of the shore line with you. Pass it around a tree, and pull it back to the boat if you can, since then to get away in the morning all you have to do is release the bitter end from the boat, and pull it aboard. Pull the line tight, as long as you've got over 100' total of line out: there is plenty of sag/stretch, and we want to keep the boat in its area! If necessary, put a crab pot float or fender on the line to warn others it's there!

Here is a sketch of a properly anchored boat with a shore line (In this drawing, S=Scope, which should be at least 4 x DL, the Depth at Low Tide):



Section 4: Specific Discussion of Boat Systems & Operations

This section of the operating manual will discuss each of the boat's systems. The systems and major components discussed are in alphabetical order as follows:

4A: Anchor & Ground Tackle
4B: Barbeque
4C: Bilge Blowers
4D: Bilge Pumps
4E: Dinghy, Davit & Outboard
4F: Electrical Systems, AC
4G:Electrical System, DC
4H: Electronics
4J: Engines & Transmissions
4K: Fresh & Waste Water Systems
4L: Fuel System
4M: Furnace/Air Conditioning
4N: Galley & Appliances
4P: Head Systems
4Q: Running Gear (Props, Shafts, Stabilizers, Bow & Stern Thrusters)
4R: Safety Equipment
4S: Sea Strainers & Thru Hulls
4T: Warning Lights, Alarms & Wipers

4A: Anchor & Ground Tackle

4A1: Anchor Bridle

There is an anchor bridle stowed on the boat in the Portuguese bridge. Use it when anchoring overnight, as it accomplishes three goals:

- It takes the strain of the anchor off the windlass, pulpit, and pulpit pulley and directs it to the bow cleats which are more suited to hold it;
- It reduces substantially the "chain noise" transmitted to the occupants of the forward cabin;
- It allows the anchor rode to have a lower angle relative to the sea bottom, thus increasing the anchor's holding power.

To use the bridle:

1. Lower the anchor normally (see page 4.2) then, after it is set,
2. Hook the bridle on the chain just in front of the anchor pulpit bow roller;
3. Then secure the bridle rope ends through the side-coaming hawse pipes, to the bow cleat on each side so the bridle lines are equal in length and as long as possible;
4. Last, operate the windlass to pay out anchor chain so the chain slacks and is supported by the bridle, the chain forming a loop right in front of the boat's bow.

If you wish, you can pay out additional chain to form a long hanging loop between the boat and bridle, which weights the chain down in front of the boat well below its normal path; thus the chain itself becomes a "kellet" or "sentinel", lowering the chain angle more than the bridle alone. The weight "drooping" the chain down like this then forms an even more effective "snubber", so the boat is gently held against the pressures if wind and tide.

4A2: Anchor Chain Locker & Anchor Jams

Hauling anchor:

There is an anchor forward on the bow deck with its chain passing over a bow roller. It is raised and lowered by the anchor windlass, The chain goes from the windlass below into the chain locker through the chain pipe behind the chain wheel ("wildcat"). The chain locker is accessed from a door in the master stateroom above and forward of the berth.

The windlass deck area.

Be careful when dealing with the chain! If a crew member is operating the windlass while a person is accessing the chain locker, be especially careful to keep that person's fingers, hands, arms, etc. away from the chain! Use a windlass handle or broomstick to deal with it!

Lowering anchor:

If the chain jams while lowering anchor, it is because one loop of the chain on top of the pile has fallen inside another loop of chain when the chain pile may have fallen over or shifted. There is no way the chain can be tangled so that you will ever need to disconnect it! One easy way to disentangle the chain is, while wearing gloves, grasp the chain as it goes into the locker, and, while lifting it above the wildcat manually, rapidly yank it up and down. This will usually free it.

If, on the other hand, this "yanking" technique fails, you must reach in to the chain locker to un-overlap the layers of chain in the pile.

4A3: Anchor Chain Measurement

The chain markings are as follows:

1st Band	2nd Band	3rd Band	Length Out
Red			25'
White			50'
Blue			75'
Red	(space)	Red	100'
Red	Red	Red	125'
Red	White	Red	150'
Red	Blue	Red	175'
White	(space)	White	200'
White	Red	White	225'
White	White	White	250'
White	Blue	White	275'
Blue	(space)	Blue	300'

4A4: Anchor Windlass

The windlass breaker to left of the pilothouse wheel.

One of the two windlass remote controls.

The anchor on Hele Mai is raised and lowered by a large Maxwell 2200 vertical Windlass on the bow pulpit. The windlass is controlled by foot-switches at the bow and toggle switches at each helm.

If the windlass should fail to operate when its foot switches are depressed, trouble-shoot as follows:

Listen to the windlass as a switch is depressed: Is the chain motionless and the motor silent? If the motor is running, see below.

Motor not running when switch is operated:

Be sure the windlass breaker in the pilothouse is “on”;

If the breaker/switch was on, try the manual up/down switch at either helm (if this works, use these switches instead of the foot switches until the foot switches are repaired);

Motor running when switch depressed, but chain not moving:

The clutch is probably loose. Remove the black cap in the center of the windlass, tighten the screw within. Try again.

If neither procedure solves the problem, consult the windlass manual to determine how to use the windlass in the manual, emergency mode.

Above: Anchor windlass. Note black cap in center over clutch screw. Right: The Barbecue.

4A5: Anchoring & Stern/Shore Line: See Section 3B.

4B: Barbeque

The boat is equipped with a fixed BBQ. It receives its propane from the same under-seat tanks beneath the flybridge L-settee as the galley. Operation is conventional: Make sure the valves are one, turn the burner on and ignite.

4C: Bilge Blowers

The boat has bilge blowers controlled by a switch in the DC breaker panel at the lower helm. These blowers are not generally needed in the cooler climates of the Northwest; they would be used in hot weather such as in southern latitudes, or to moderately cool the engine room when an operator has to be in it when the engines are, or have been recently running.

4D: Bilge Pumps & High Water Alarm

The boat has three bilge pumps, one in each bilge area. There is a circuit breaker for each pump on the main DC breaker panel, right row, 10th, 11th and 12th from the top. When these breakers are "On", the pumps are in the "automatic" mode, controlled by their float switches. To run the pumps manually, use the "Manual Bilge Pump Control" switches on the switch panel. When set to "Manual", the pump is running without regard to the float switch. This is used by the operator to check the bilges, to drain water below the range of the float switch, and to bypass the switch in case it is defective. There is also a "high water alarm" on the safety panel (see below).

If a float switch fails and runs the pump continuously, you can turn it off by using the breaker. ***If you turn off the breaker, check that pump's bilge frequently.***

Note the warning lights for the High Water Alarm System. The alarm will sound and the lights will warn if water is higher than any of the bilge pump float switches.

4E: Dinghy, Davit & Outboard

4E1: Davit

This boat uses the trawler mast and boom with two electric winches as a davit to launch and retrieve the tender.

Checking for Water in the Dinghy

When the dinghy is on its rests on the aft flybridge deck, the storage position allows water to collect in the bow of the boat, and the bilge pump does not evacuate it because it is forward, not aft. ***You may need to drain this water using this procedure:***

While hoisting the dinghy as in step (4) below, lift for a moment with only the bow sling cable attached, so the dinghy tips aft, either draining the water by the electric bilge pump or by removing the dinghy's aft drain plug.

Launching the Dinghy

Never hoist or lower the dinghy with anyone in it! To do so overloads the davit and could cause injury or death.

The davit runs on DC. It's a good idea to have the generator or an engine running to avoid depleting the batteries.

The dinghy winch and control electric cable socket (arrow).

The locking pin holds the boom in its extended position.

1) Remove dinghy canvas and straps, if any;
2) Be sure the davit main switch under the aft saloon settee is "On" (1.12);
3) Attach the electric remote controls (stowed in the compartment on the flybridge console to port of the helm) to the connector in the base of the davit; if the davit boom is not extended, the davit cable is *raised* ("in") and the boom extends itself until the lock "clicks" into place in the extended boom.]
4) Using the up-down control, attach the hoist line to the tender's bridle;
5) With a crew member in place on the lower deck to receive the dinghy's painter to control it after it clears the flybridge, raise the dinghy, swing it to the port side of Hele Mai and lower it to the water.
    - *Raising/lowering the hoist hook raises and lowers the dinghy.*
6) Remove the line from the dinghy and ***secure the boom so it does not swing while the dinghy is not holding it in place.***

WARNING: Be careful where you step on the flybridge while launching or retrieving the dinghy so as not to fall off!

Using the davit to retrieve the Dinghy

Never hoist or lower the dinghy with anyone in it! To do so will overload the davit and could cause injury or even death.

1) Attach the line from the mast and boom to the dinghy bridle;
2) "Tilt" the motor up so when aboard, it will not hit the flybridge deck. Engage tilt lock (see below under "Outboard Motor".)
2) Using the winch, hoist the dinghy having posted a crew member on the lower deck to protect *Hele Mai* ;
3) **Using care to protect the lower end ("skeg") of the outboard motor from damaging *Hele Mai's* decks or rails,** swing the dinghy into place over its supports and lower it.
4) Stow the hoist control and re-attach the tie-downs and canvas as necessary.

4E2: Dinghy

The dinghy aboard this boat is a 12-foot A-B hard-bottom inflatable boat with a center console. .

For safety, and compliance with U.S. rules, there should be a life jacket aboard the dinghy for each passenger aboard whenever the dinghy is at sea.

VHF Radio.

Dinghy Instruments.

Please be careful when pulling the dinghy ashore on beaches to minimize damage and scratches to the bottom. Dragging can be reduced by two persons if one is on each side. Don't "Ram" the beach; you can bump up to the beach gently and step ashore over the bow, pulling the dinghy a little more ashore as each person off-loads. Don't forget to raise the outboard!

Fuel fill pipe.

The dinghy is fitted with a fuel gauge, tachometer, tilt-indicator, compass and speedometer; a Garmin fish finder, and a VHF radio.

The fuel filler is on the starboard side of the console.

There is a battery switch under the dinghy aft seat.

To avoid inadvertently discharging the battery, turn the battery switch "off" after dinghy use when it is hauled aboard Hele Mai!

Battery switch.

Don't exceed 25mph!

<u>The Dinghy operator must be qualified and hold a Washington State Boater Education Card</u> if required by law. No one under 18 is to drive the dinghy without an adult present. **All operators must follow applicable laws!**

4E3: Outboard Motor

The outboard motor for the dinghy is a two-stroke, 40-horsepower Tohatsu Outboard. It gets its lubricating oil using the oil-injection method, as oil comes from a reserve tank and is added to the fuel as necessary for lubrication.

Do NOT mix oil with the gasoline!

DO keep the oil tank topped up!

To check and/or fill the oil tank, lift the access cover and remove the tank cap.

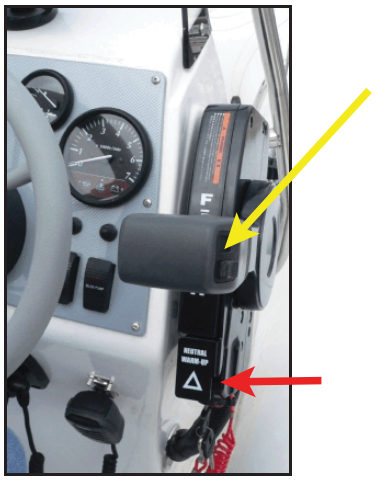
The Tohatsu Outboard. Arrow points to oil tank access cover.

Outboard Operation:

1) Be sure engine is lowered. The rocker switch on the end of the control handle operates the motor's electric tilt.
2) Pump fuel line bulb until it resists your squeeze.
3) Turn key to center "On" and "Right" to start.

   There is an automatic choke!
4) Lift the lever on the top of the control quadrant to advance throttle without engaging gears.
5) From neutral, grip handle to release center lock and push control handle forward/up or back/down to engage gears and advance throttle either way.

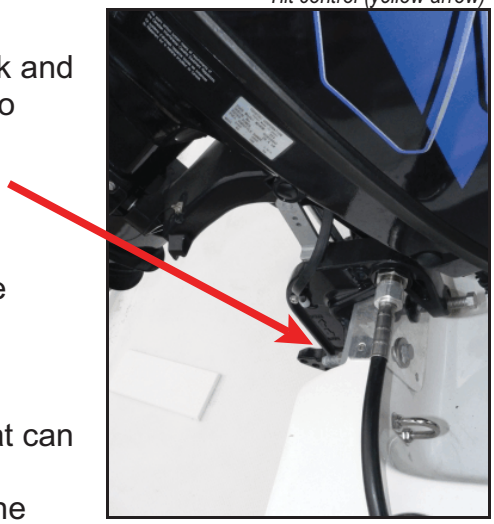
Cover removed. You can clearly see the oil tank!



Motor control qudrant. Tilt control (yellow arrow)

Tilt Lock

The motor has a lock to keep it tilted once it is raised using the electric tilt feature. This lock must be released to lower the motor!



Tilt Lock.

Battery charging:

There is a battery charger aboard *Hele Mai* that can be plugged in on the flybridge and connected to the battery within the dingy seat if you inadvertently run the battery down.

4F: Electrical Systems, AC

The AC electrical system is controlled at the main electrical panel. It has an AC metering section, and an AC 110-volt section. It also has the DC sections, discussed later.

Note: The panel photographs are taken at an angle to reduce glare from the light reflections on their high-gloss finishes.

4F1: AC Panel: Metering Section

The top portion of the AC and DC Power Panel. The switch (arrow) between the meters switches the voltmeter to circuit #1 (up) or #2 (down).

The top portion of the power switch panel is devoted to giving the operator voltage and current indications for both AC and DC power. *The left three meters are AC voltage and circuit #1 and circuit #2 current; the right-hand two meters are for DC power, see below.*

When connected to 50-amp shore power or when the generator is running, you will have 110-volt power on both circuits; this is because a 50-amp connection and the generator have a three-wire plus ground connection: Two “Hot” wires and one “Neutral” plus ground. From either “Hot” to “Neutral” is 120-volts!

In the photo, we have readings of barely over 110-volts and almost no current.

Note: In photo, inverter switch was “Off”. It should have been “On”!

4F2: AC Breaker 110 Volt Panel

This section of the AC panel provides standard 110-volt power throughout the vessel. Below are each section's circuits and their uses ("B" equals "Breaker", "S" equals "Switch and Breaker"):

Green = Leave this breaker on Always; ***Yellow = Use when Item is Needed;***

Blue = Powered by Inverter if no generator or shore power;

Red = Use with care only when required.

110-Volt Breakers

Cabin/Engine Room Plugs	B		*To those receptacles
Galley/Saloon Plug	B		*To those receptacles
Pilot House Plugs	B		*To those receptacles
Refrigerator	B		To Refrigerator Thermostat
Washer/Dryer	B		To Washer & Dryer
Microwave/Stove	B		* To Microwave Oven
Icemaker	B		* To Icemaker Switch
Water Heater		S	To Water Heater Thermostat
Battery Charger** **DON'T USE**		S	To Battery Charger
AirconStateroom	B		To Stateroom A/C Switch
Aircon Saloon	B		To Saloon A/C Switch
Aircon Pilot	B		To Pilothouse A/C Switch
Cooling Pump		S	Turns on A/C Cooling Pump
Eng. Rm. Lights	B		*To E/R Light Switch @ door
Trash Compactor	B		To Trash Compactor control
Watermaker	B		To Watermaker

* Items powered by Inverter when it is on and there is no Generator or Shore Power.

** The "Battery Charger" breaker is left "Off" except in emergencies since ***all charging when the engines are not running is normally by only the inverter, and it is automatic***

.

Is it 110 or 120 volts?

The fact is, these voltages are "arbitrary" values! It depends upon the shore-side utility or boat generator settings, as well as the amount of load on the cable or generator. In the "real world", it doesn't matter as long as it's at least about 105 or volts!

4F3: AC Breaker Source Selection

It is up to the operator to select the source of AC power for the boat; this is done with the Generator - Shore Power #1 - Shore Power #2 Switch and the main power breakers.

Normal Shore Power Operation:

For normal operation when connected to shore power with a 50-amp cable, you will have:

- the switch set to Shore Power #1 or #2 depending on whether the connection is fore or aft;
- the “Daily 120v” and “Air Cond.” breakers “on”;
- the white “Inverter” breaker “on”;
- all required AC equipment breakers can be “on”.

In this way, shore power is connected to both the air-conditioning and normal AC circuits.

Note: In photo, inverter switch was “Off”. It should have been “On”!

Limited Shore Power Operation:

If there is limited shore power, such as when only a 30-amp connection is available, you will have to reduce usage. Do this by leaving the air conditioning breaker off. (If you need air conditioning, you will have to run the generator.) You will have:

- the switch set to Shore Power #1 or #2 depending on whether the connection is fore or aft;
- the “Daily 120v” “on” and the “Air Cond.” breaker “off”;
- the white “Inverter” breaker “on”;
- all required AC equipment breakers can be “on” except the Air Conditioning and Pump breaker.

Generator Operation:

The boat’s generator can run everything on the vessel!

If when running, there is no 110-volt power at the panel, check the main circuit breaker on the generator (see section 4F6).

Whenever away from the dock, you should have:

- the switch set to “Gen”;
- the “Daily 120v” and “Air Cond.” breakers “on”;
- the white “Inverter” breaker “on”;
- all required AC equipment breakers can be “on”.

Inverter Power Operation:

If the inverter is the source of power such as when you are at sea underway or anchored and the generator is not running, it reduces the items that can run to avoid running down the batteries or overloading the inverter. Only the items with an asterisk (“*”) on the AC panel on page 4.9 will be operative.

4F4: AC Shore Power Connect

The large “GEN - OFF - SHORE 1 - SHORE 2" switch on the AC Power Supply panel are used to determine the source of AC power for the boat. The “Shore Power” switch should always be “OFF” whenever you are connecting or disconnecting the boat to shore. This is true so that you do not draw an arc from the plug due to the load of the boat on the connector’s pins: such an arc will burn the contacts and eventually cause them to overheat when in use, creating a fire hazard.

Shore power/generator selection is made on the AC Power Supply panel.

The switch determines *which* shore power outlet you’re using: “1" is Forward, “2" is Aft. Select the one you’re using by the switch.

Once connected to shore power, monitor the AC voltmeter and ammeter to be sure you have not overloaded the circuit.

> ***Important Note: If the house batteries are low when you first hook up to shore power, and the inverter is turned on (as it should be), the inverter will begin charging its batteries at a very high charging rate (up to 125 amps of charging), drawing a lot of shore power current. Until this demand reduces (see “AC Inverter System” above), you should turn “OFF” other high-current AC appliances such as the water heater.***

You can then turn on AC appliances as needed. Watch the ammeter to be sure you don't exceed the dock's available supply, typically 30 amps.

Here are some estimates of typical AC power consumption for various appliances:

Water Heater	15 amps	Inverter	up to 30 amps
Hair Dryer	12 amps	TV	1.5 amps
Coffee maker	10 amps	Microwave	12 amps
Toaster	12 amps	Washer/Dryer	up to 20 amps

If you overload the shore power connections, you may trip the dock breakers, or the boat’s own breakers on the left of the switch.

4F5: AC Shore Power Reverse Polarity

Although we tend to think of AC Electricity as having only two conductors, it actually has *three*. One of these is called “neutral”; one is “hot”; and one is “ground”, that is, it is supposed to be the same as the water around the boat and the earth ashore.

The vessel and many of its appliances rely upon these connections having the correct “polarity”, or relationship to one another and the earth; this is essential to be sure that users of AC equipment do not get a shock when touching and AC equipment.

Now in a house ashore, it’s easy: We don’t “plug in” the house, for it *stays connected to the utility company all the time!* But in a boat when in the harbor, we do plug in using our Shore Power cords (and sometimes using extension cords). If the outlet to which we plug our cord, or if the cord itself is mis-wired, then these connections can become mixed up, and then

there is a significant chance of getting a shock or just as bad, a chance that running gear outside the boat will be subject to rapid corrosion, because the boat is immersed in sea water, a good conductor of electricity.

To protect the vessel and its crew from such contingencies, a “Reverse Polarity” light will illuminate when the connection turned on.

If the red “Reverse Polarity” light should illuminate when connecting to Shore Power, immediately disconnect the cable and contact the harbor master advising him/her of the problem. Do not risk shock or system damage!

4F6: AC Source Alternatives: Generator

The ship’s Westerbeke Generator provides 10,000 watts of AC power to the vessel and is used for battery charging, heating hot water, the washer/dryer, all air conditioning, and operation of incidental AC appliances.

The generator is to starboard aft of the starboard engine in a sound shield. Main circuit breaker is behind door at arrow.

The generator is in the engine room. For full service access, unlatch and remove the panel on port side of the sound-shield cabinet. Access for oil checks is through the little door on that same side, while to check coolant, the coolant tank is to starboard of the aft end of the genset.

In this photo you can see the generator’s sea strainer, seacock, and coolant tank.

Also important is checking the sea strainer (see page4.47) to be sure it has not accumulated substantial debris while the generator was run for extended periods, particularly at anchor.

Starting the Generator:

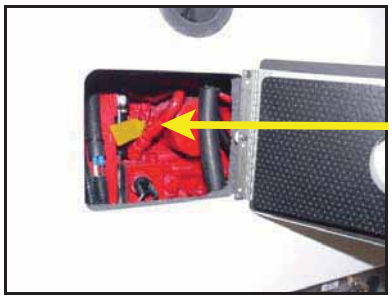
The generator controls that are normally used are on the breaker panel in the pilothouse.

1) Press the Pre Heat switch and hold for 15 seconds;

2) <u>While holding the Pre Heat switch</u>, *press* the start switch until it starts, *only when it is started and running* should you release the two switches.

However, do not hold the switch for longer than 15 seconds! See “if generator does not start” warning under “Generator Problems” below! (More next page)

Upper door on the generator sound shield accesses the instrument panel.



(Above) Inside the access door on the front of the generator is the dipstick;

Generator with the sound shield off. Yellow tag is on dipstick.

Generator Controls

2) Check or listen to the generator exhaust to confirm that cooling water is being pumped.

3) After a brief warmup of a minute or so, turn the large power selector switch to “Gen”. (The “Running” light by the start/stop switches should be lit.)

Stopping the Generator:

1) Switch the large power selector switch in the AC Power Supply panel “Off”. This removes the load for the generator and allows it to cool down.

2) *After at least a minute to allow the generator to cool down*, press and hold the stop switch down (toward the stop sign) until the generator comes to a complete stop.

Generator Automatic Battery Charging Function:

The generator system on *Hele Mai* is arranged to automatically start and charge the batteries whenever battery voltage falls below 11.9 volts. This requires that, when not on shore power, the shore power/generator selector switch be on “Gen”. The switch should be “off” overnights between 10PM and 8AM to avoid disturbing vessels at anchor.

Generator Problems:

The generator monitors its own operation, detecting any loss in oil pressure or any overheating. If either occurs, the generator shuts itself off, and will not keep running when you try to restart it.

If generator does not start:

Before repeated starting attempts, shut off sea water supply to avoid water-locking the engine by closing the seawater supply to its sea strainer! Then, remember to turn it back on when the generator starts.

This is so that you do not seriously damage the generator by having it ingest cooling sea water that it is unable to evacuate from its exhaust since there is no exhaust pressure!

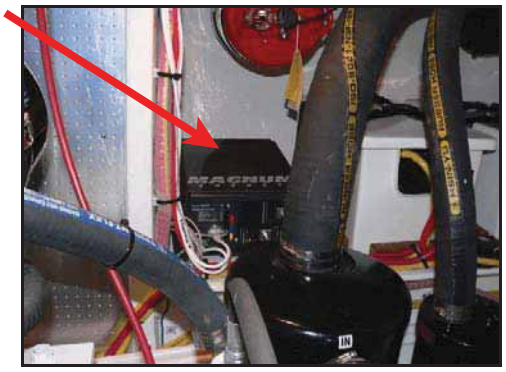
4F4: AC Source Alternatives: Inverter System

The Inverter Makes AC from DC...

The Inverter is used to **provide AC to the boat** *when there is no shore power*. It is wonderful, for example, to use the inverter to make a pot of coffee when the engine is running and you are underway, or to watch TV in a quiet anchorage, or use a hair dryer for a few minutes in the morning. But for long-period use of AC by large appliances, the engine or generator must be running or you must have shore power available.

For instance the microwave, typically, will draw about 50 amps of DC when using the inverter to run it, *so in six minutes you use one-tenth of an hour at 50 amps, or five ampere-hours*. That's okay. But what if you want to cook a roast for 30 minutes? You would use up a lot of energy on that one job alone! That’s too much; use the propane stove or oven instead.

For a short task, the inverter is great: no starting the generator, no noise, no fuss, the power is there. If the



The Inverter itself is in the Engine Room.

main engine is running, use it all you wish, as long as you don't try to do two huge jobs at once: The inverter produces a maximum of 3,100 watts of pure sine wave energy at a time. So the inverter should only be used with the outlets and the microwave. It will not run the water heater, battery charger or refrigeration.

...and also is a Battery Charger, Making DC from AC!

The Inverter can also do the reverse: *If there is AC power available from a shore-side source or the generator*, **it can recharge the house batteries.** The battery charger function receives that power through the "Inverter In" breaker on the AC panel. Since this breaker must be "On" for the batteries to charge using AC power, and you will want to charge the batteries at every opportunity, we suggest that you *leave it "On"* for the duration of your cruise.

As noted above under the "Connecting Shore Power" section, be mindful that **the Inverter can draw a lot of current** when charging the batteries, especially when first activated upon connection to shore power. Thus, you need to be careful not to overload a shore power circuit by running other high-draw AC appliances at the same time. Monitor the AC Ammeter to make sure the load remains below the available current as determined by the shore power service from the marina, normally 30 amps.

Leave the Inverter set to its automatic settings. It will automatically change modes from "Shore" to "House" to "Invert" and "Charge"!

Inverter Control LED Status Lights

"**PWR**" is lit if there is AC available for battery charging (from shore power or the generator).

"**FAULT**" Lit: The system detects a problem (this is rare): See the manual.

"**CHG**" Rapid blink: The unit is getting power but is not yet charging;

Steady on: The Inverter is charging the batteries;

Off: The charger is not on nor is it charging;

Slow Blink: The charger has insufficient AC power to charge the batteries, you need to reduce the AC load or start the generator.

"**INV**" "ON": The inverter is on and supplying power to AC equipment on the boat;

Slow Blink: The inverter is on, but there is no equipment drawing power from it;

"Off": The inverter is not running.

Inverter Control Buttons:

Touch a button to "wake up" the display before anything will work!

On/Off Charger: Controls the charger function of the inverter. **<u>Should be left "On" at all times.</u>**

On/Off Inverter: Controls the inverter function. Should be left "On" except when at a moorage for long periods, such as overnight or longer, when the generator is not on and there is no shore

The inverter control.

power, to avoid depleting the batteries in case an AC appliance or light fixture has been left on.

Shore: Pressing will display the present maximum power the charger will require from the boat's shore power connection; options are 5, 10, 15, 20, 30, and 50 amps. For example, you might normally want it on "20", but if limited to a small dock connection, may want it at "10" so that you don't trip the dock circuit breaker.

Meter: This button sets the display to show DC amps and voltage to/from the batteries.

AGS / Setup / Tech: Please *do not use* these soft-keys.

Remember the important note above under "Connecting/ Disconnecting Shore Power": The inverter, if on, will draw a lot of current when bulk charging, so be careful not to overload a shore power circuit. If "PWR" and "CHG" are both lit, you will want to monitor the AC Ammeter by the lower helm and possibly reset the "Shore" setting!

Also, when using the inverter, be sure to have on only the "plugs" (receptacles), the microwave, and the icemaker (marked with an * in the AC power panel breaker illustration above) , lest you overload the inverter!

In summary, the inverter should be on whenever shore power is present or the generator is running, and it may also be left on when underway. It is a good idea to turn the inverter off at anchor (when the generator isn't running), turning it on only when you want to use something briefly, as above; in this way, you will avoid running down the house batteries just because someone left some AC appliance plugged in and forgotten.

4F5: Generator Automatic Standby

The generator on Hele Mai has an automatic battery charging feature. If battery voltages fall under 11.9 volts, the generator will automatically start and charge the batteries. That is why whenever we are away from the dock, we turn the AC power selector switch to "GEN". In this position when the generator starts ir can feed the charger.

4F6: Glendinning Cablemaster System

The boat is equipped with a Cablemaster system which automatic reels out or in the main shore power cable. It is operated with a switch on the forward side of the transom mounted on the swim shower housing, while the cable itself feeds in/out above the swim step. This is the main power shore cable for the vessel.

4G: Electrical Systems, DC

4G1: DC Concepts

Each year it seems more folks are confused by the operation of electrical systems on yachts than by any other subject! Don't feel discouraged if something isn't clear: you've got company in your confusion. So let's try to cover some theory here first.

Most of the equipment on any boat is run by 12 volt DC electricity from the boat's batteries. This is true because DC should always be available: we have batteries aboard even when there is no shore power! If the batteries aren't run down, everything should work, just like in the family car.

Since the batteries are used so much, we have to replenish, or charge them. The most important way we do this is by alternators on the ship's engines. In most cases the engines will provide enough electricity to run everything, and still have some energy left over to add back to the batteries, that is, to charge them.

Ah, but what if the engines aren't running? Then, the batteries are slowly depleted until they have "run down" and there is no more electricity stored in them . . . a big problem, because then we not only can't run all the neat stuff on the boat, we can't start an engine to get more electricity.

So a good skipper and crew has "electrical power management" in mind whenever they turn an electrical gadget on or off!

It is with this concern that we can cite a reality: If we need more electricity than the batteries alone must provide, and if the propulsion engines aren't running, we will need to get our electrical power from an alternative source! That's the most important reason why we plug the boat in to shore power or use the generator: To keep from running down the batteries. For by using battery chargers getting their power from shore power or the generator, we can keep the batteries charged, or, at least, from getting too low.

In modern, luxury cruising boats, however, there is another important factor: Some of the "goodies" we like to have on board such as hair dryers and microwave ovens require ordinary household electricity. This is 120 volts AC. It is different from DC. So if we want to use these things when we're not at a dock, we must have another way to get 110 volts AC, and for this we use the generator, or an "inverter", an amazing high tech gadget that takes 12 volts DC from the ship's batteries and makes it into 110 volts AC!

So here's what we've got:

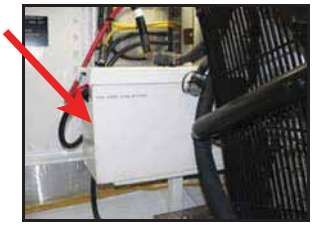
- A lot of stuff running on 12 volts DC with that electricity from the batteries;
- To keep the batteries from running down, we have alternators run by the engine, and battery chargers that get their power from shore power or the generator;
- For the stuff that runs on 120 volts AC, we have shore power, the generator, or, for making AC out of the batteries' DC, the inverter.

4G2: DC Batteries

The batteries on this boat are not just one, big all-purpose battery. To have redundancy, there are actually several "banks" of batteries assigned different tasks. This table outlines the batteries on the boat, their locations, their charging sources, and what they power:

Battery Name	Location	Charging Source	Use
Stbd Engine & House Batteries	Engine room outboard of engine. Starting battery aft-most of the three.	Engine Starting: Engine alternator and ship's battery charger. House: Engine alternator and inverter.	Operate engine starter and provide house voltage.
Generator Battery	Engine room aft to starboard of generator	Generator's own alternator and ship's battery charger	Start generator's engine
Port Engine & House Batteries	Engine room outboard of engine. Starting battery aft-most of the three.	Engine Starting: Engine alternator and ship's battery charger. House: Engine alternator and inverter.	Operate engine starter and provide house voltage.
Thruster Battery	Under forward berth	Ship's battery charger.	Operate bow thruster

A "starting bank" consisting of a 12-volt battery is *used for starting each main engine only*. That way, we won't run it down playing the stereo, for instance, and then be unable to start an engine. This battery is charged by the main engine's "stock" alternator when running, or by the battery charger if it is on when there is shore power or the generator is running.



Engine starting/house battery bank engine room stbd.

In the event of a low engine-starting battery, the operator can start the other engine or the generator to recharge it.

> ***Note: If it takes more than two attempts to start an engine, turn off its sea water valve to avoid*** water-locking the engine until it starts; then be sure to turn it back on!

The generator starting battery outboard of the generator's aft end.

Another 12-volt battery (in the engine room starboard aft alongside the Genset) provides 12 volts for starting the generator, charged by the generator's own alternator if it is running, or by the battery charger if it is not and there is shore power.

A "house bank" consisting of parallel-wired 12-volt batteries provides power for all the pumps, interior and exterior lights, horns, navigation and radio gear, etc., the boat's "house". They are charged by the alternators on each main engine and, when there is shore power or the generator is running, by the inverter if it is on.

Finally, be aware that the generator system on *Hele Mai* is arranged to automatically start and charge the batteries whenever battery voltage falls below 11.9 volts. This requires that, when not on shore power, the shore power/generator selector switch be on "Gen".

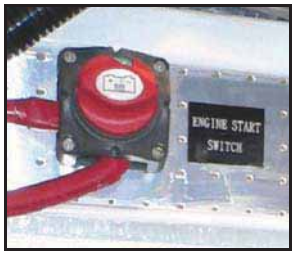
Another 12-volt battery located in the bow of the boat powers the bow thruster, as noted in the “Thruster” section on page 4.46. This is charged by the vessel’s battery charger.

What redundancy!

In the event of an electrical fire, there must be a way to disconnect the batteries. This is done with:

(1) The emergency House battery switch located on the main power panel (normally left on “Both”);

(2) The starting battery switches on the sides of the engine room just forward of each engine (also normally “On”); and,



One of the start battery main switches.

The house battery switch. Leave on “Both”.

(3) In the cable from the generator battery to the generator, the generator battery switch (also normally “On”.;

4G4: DC Breaker Panel

The right side of the power panel controls the DC power distribution to the boat’s various DC equipment.

Author’s note: The electrical switch panel is photographed at an angle to avoid glare.

The nerve center of the DC electrical system is the DC circuit breaker panel by the helm. On this panel are the switches that control power to the boat’s various systems.

As for the breaker panel itself, just as in your home, most of these switches are true “circuit breakers”: they feed power to somewhere in the boat where there is another switch which, in turn, turns the item on and off. An example of this would be the circuit breakers for the cabin lights: If the breaker is turned on, the light won’t work unless you turn it on!

But some of the other breakers also serve as the switch for the item. An example of this would be the underwater lights breaker or the macerator pump breaker. So here is the list of switches and how they're used: (“B” means used as breaker, “S” means used as switch AND breaker). The colors in the descriptions below mean:

Green = Leave this breaker on Always;

Yellow = Use when Item is Needed;

Red = Use with Caution in Exceptional Circumstances

BREAKER			USE	BREAKER			USE
Master Lights	B		To Master Stateroom Lights	Fresh Water Pump	B		To F.W. Pump Pressure Sw.
Mis Room Lights	B		To Guest Stateroom Lights	Refrigerator	B		To refer thermostat
Engine Rm Lights (DC)	B		To Switch inside of E/R door	Autopilot	B		To autopilot
Saloon/Galley Lights	B		To Switches in Saloon & Galley	Electronics SubPanel 2	B		To electronics panel #2
Pilot(house Lights	B		To Switches in Pilothouse	Galley Blower	B		To Galley blower sw.
Deck/Spreader Light	B		To Panel Switch	Wipers/Horn	B		To Wiper & Horn switches
Navigation Lights	B		To Panel Switch	D.C. Power	B		Cig Ltr Outlets & Sat. Rec'r
Searchlight	B		To lower helm ACR control panel	Oil Transfer Pump	B		To E/R Oil Chg. Pump
Owner Head	B		To Head control in Master Head	Engine Room Blowers		S	Turns on Blowers
Macerator Pump		S	Turns on overboard pump	Forward Bilge Pump	B		To Float Switch
Sump Pump		S	To sump pump **LEAVE ON!**	Engine Room Bilge Pump	B		To Float Switch
Radar	B		To Radar	Laz Bilge Pump	B		To Float Switch
Electronics SubPanel 1	B		To electronics panel #1	Stabilizer		S	To Stabilizer Control Unit
Cablemaster	B		To Cablemaster in/out switch	Head Exhauster	B		To Master Head Exhaust Fan
Underwater Lights		S	To underwater lights	Fuel TX Pump	B		To Transfer System Switch
Wash Down Pump	B		To deck w.d. pump pressure sw.	Courteous Lights	B		To "Night Lights" Switch

In general, when on the boat, you'll have all the green and all the yellow breakers "ON" with the Macerator Pump, Fuel Transfer Pump and Oil Change Pump "OFF".

When not aboard, only the green breakers may be left on.

4G5: DC Switch Panel, Helm

The DC Switch panel located at the pilothouse helm controls a number of auxiliary items; some of these are also controlled at the upper helm.

4G6: DC Voltmeter & Ammeter

At the top of the main Breaker Panel are the electrical meters, and the right-hand two show house battery DC voltage and current.

More readings are available at the inverter control panel; see section 4.14 above.

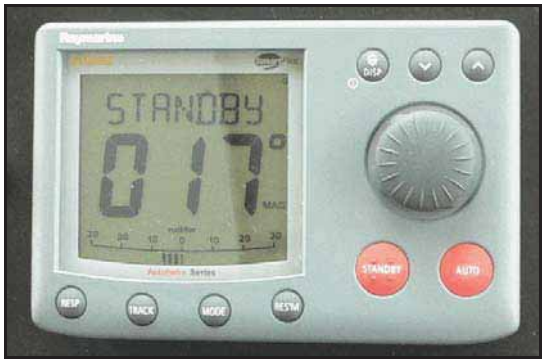
Since the house battery is the primary power for instruments, lighting, and other important vassel systems, you will want to monitor it! Whenever you are dependent exclusively on battery power (particularly before retiring at night or leaving the vessel at anchor) you should get in the habit of checking the ammeter to be sure that you are not running down the batteries with some extraneous unit turned on.

4H: Electronics

The boat is equipped with extensive electronic equipment, including Icom fixed and portable VHF radios, *Raymarine* Radar, an *Interphase* forward-looking Sonar; *Peoplenet* communications system; *Raymarine* GPS/Plotters with *Raymarine* display; conventional and graphic *Raymarine* Depth Sounders; a *Raymarine* Speed Log; a *Raymarine* Autopilot with control at each helm and a remote control, a *FLIR* Infra-Red imaging system, and a *Raymarine* Wind Indicating System. The engines are monitored with a *John Deere* electronic monitor with LCD display (See "Engine"). An intercom is also provided. There is a complete stereo system. ***The Broadband Express and Iridium System are for the owner's use only.***

Each unit is provided with a dedicated or shared circuit breaker in the DC power panel; this breaker must be on for the unit to be used. Then the unit's own power button must have been depressed or its knob must be also be in the "ON" mode.

4H1: Electronics: Autopilot



The boat is equipped with a *Raymarine* Autopilot including a control at each helm and a remote at the lower helm. The autopilot must be "On" for navigation data to reach other electronics.

For the unit to operate, be sure the breaker is on in the Power Panel.

Basic operation is simple:

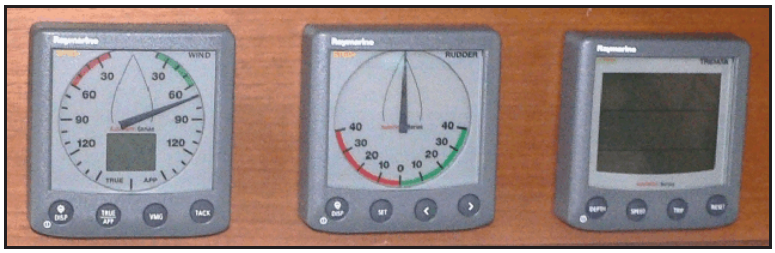
- STANDBY puts the pilot in the standby mode. When on, the display will show the pilot's status "Standby", and on the bottom the scale shows the current rudder position port or starboard.
- AUTO Engages the autopilot to hold the heading that existed when pressed. When engaged, "Auto" appears above the heading that was set.
- TRACK Connects the autopilot to the vesel's navigation system. "Track" appears in the display in front of the heading called for by the navigation system.
- RESP Decrease or Increase pilot's sensitivity by pressing this button then the ▲ or ▼ buttons. ***DO NOT CHANGE THE RESPONSE!***
- MODE Allows you to use the autopilot for power steering; press the ▲ or ▼ buttons to select mode.
- RESM Resume the previous heading.
- (KNOB) Turn to set a new heading.

A Remote control allows the operator to conveniently operate the autopilot while not at the lower wheel, but on the settee. It is clipped on the console.

Each display also shows the rudder position on its lower edge; in the picture above, it is about 6 degrees. For full details on the autopilot, see its Manual.

> ***Maintain a careful lookout when using the autopilot! It is an aid to comfortable cruising, not a replacement for an aware helmsperson! Remember, you can disengage it quickly simply by pushing "STANDBY".***

4H2: Electronics: Digital Depth Sounder/Knotmeter/Log



Left to right: Wind Direction and Speed; Rudder Position; Depth & Speed

There is a *Raymarine* standard depth sounder system at the pilothouse helm on the overhead electronics panel, with a repeater on the flybridge and in the master stateroom. It shows the depth *BELOW THE KEEL* and speed in knots, trip mileage in nautical miles, water temperature, etc. **It operates at 200 Hz** (see note below in *Raymarine* graphic depth sounder description below).

Operation of this system is described in its operating manual. It is turned on by the breaker in the DC power panel.

Because our waters are sometimes very deep, the depth sounders will not display or will stay on a high depth reading when the water's depth is beyond its capacity.

Remember when backing up, or crossing a "tide line", that turbulent water from the tides or boat's screws (or those of another boat) can interrupt the sounding information received by the unit. Be careful!

Note that our Northwest waters are rocky and depths change rapidly. You should be especially careful to study your charts, and then check them often whenever running in depths of 50 feet or less, so that you don't hit a rock! Just as our islands "pop up" to heights of 50, 100, or even thousands of feet in a very small horizontal distance, so do rocky obstacles!

4H3: Electronics: Depth Sounder - Graphic

This depth sounder (shown by paragraph 4H2 above) works on either of two frequencies and serves as an accurate fish finder as well. Display is on any of the Raymarine multipurpose displays.

For full operation instructions, see the unit's manual.

4H4: Electronics: Depth Sounder - Interphase Forward-Looking

There are two displays for this depth sounder system, one at each helm. This unit is intuitive in operation, and the more it is used, the more you will understand its important role in safe operation of *Hele Mai.* It shows obstructions forward and to the sides of the vessel. See its manual for operating and interpreting details.

Interphase depth sounder.

4H5: Electronic Displays

The pilothouse has two displays that can show the plotter, radar, sounders, cameras, fish finder, FLIR, etc. Each operates independently of the other.

To select the camera, hold in **Page**, then **Boat System** |**OK**| then touch **Page** | then press the **camera icon**. Camera positions include:

#1 = Engine Room;

#2 = Looking Aft;

#3 = FLIR System;

#4 = Camera on Mast Looking Aft.

Engine Room

Looking Aft

Aft from Mast

4H6: Electronics: FLIR System

Hele Mai is fitted with a FLIR Navigator II Infra Red Thermal Imaging System, allowing you to see clearlyat night, through smoke or haze.

NOTE: In spite of the installation of the FLIR System, operation of Hele Mai in darkness is still subject to the provisions of your charter agreement.

A FLIR Image

The FLIR Joystick Control Unit

Operation of the unit is through the joystick control in the pilothouse. The circuit breaker on the electronics sub-panel must be *ON*. Images appear on the Raymarine displays as “Camera 3". Here is a control summary (see the FLIR manual):

The *power button* (top left) turns the unit on.

The *joystick* (knob) controls where the unit is looking.

The *dim* button controls the brightness of the control panel.

The *home* button returns the camera to the straight-ahead position quickly, after which you can resume using the joystick.

The *zoom* button toggles the scene to twice its magnification, and a “2x” will appear.

The *scene button* cycles through *night running, day running, man overboard* and *night docking* settings, changing the brightness and contrast of the image. You should try cycling through these to get an idea of which setting is most appropriate.

The *B/W* button toggles between presentation color and black and white modes.

4H7: Electronics: Plotters/Electronic Charting Systems

The boat is equipped with Raymarine plotting software which runs on any of the Raymarine displays at either helm; the software includes charts and even photo images where available. It will always make your location easily identifiable.

Raymarine *radar display. Boat was in Bellingham, and photo imaging of the harbor was also available.*

THE ELECTRONIC CHARTING SYSTEM IS NOT A SUBSTITUTE FOR CAREFUL STUDY OF TRADITIONAL PAPER CHARTS. You are required by maritime law to use your paper charts for navigation information, especially since electronic chart technology does not always permit full cartographic details to show. The Electronic charts are for convenience only!

When turning on the Raymarine displays, turn on the one in front of the helm wheel first and turn on the radar scanner there; unless this is done, the others will not function.

4H8: Electronics: Raymarine Radar

The boat is equipped with a radar set that allows display of a radar image on the Raymarine screens at both helms, the same ones that show navigation information. These are used, combined with the electronic chart unit, for operation in restricted visibility, with the radar primarily serving as a device for collision avoidance while the chart unit provides position.

When you turn on the *Raymarine* unit, it will display a data screen. Press the power button again to display the radar information.

Proper and safe use of a ship's radar requires lots of practice and careful study. While you are using the boat, you can have the radar on as much as you like to get used to the way it displays images, but for detailed operating instructions we refer you to the radar's own complete manual.

4H9: Electronics: Rudder Indicator

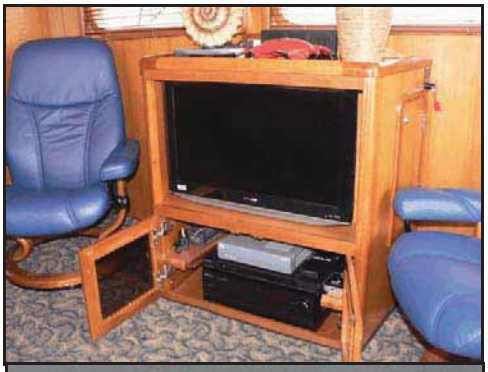
Hele Mai is equipped with a Raymarine rudder indicator at each helm. It is turned on when the autopilot power is on. Operation is entirely automatic. (In the illustration by paragraph 4H2 above, the indicator is off; when it is on, the arrow points at its scale.)

4H10: Electronics: TV/DVD/Stereo/CD/Satellite Receiver

In the saloon across from the settee is a TV and a stereo receiver with AM/FM, and a CD/DVD player. This is like a home system.

A CD player is in the pilothouse that has remote controls in the pilothouse and on the flybridge.

A remote control for the CD player in the pilothouse



The remote-controlled CD changer.

TV Inputs are:

AV1 = Xbox

AV5 = Satellite TV

AV6 = DVD Player

Audio Inputs are:

Audio 1 = iPod Dock (then use dock remote)

Tuner = AM/FM Radio

“Zone 2" is the Cockpit Speakers

Another complete entertainment system is in the master stateroom (not shown).

VHF Radio

4H11: Electronics: VHF Radios

There is an Icom VHF radio at the lower helm station; another is on the flybridge. The radios are designed for easy access to Channel 16 which is the hailing and emergency channel in the Northwest. In addition, they use Digital Selective Calling for emergency communications. Detailed instructions are in the manuals.

A portable VHF radio is on the starboard side shelf for use in an emergency.

4H12: Electronics: Video & Weatherfax Systems

The Raymarine display also can show two video cameras’ images and the Weatherfax System. Press and hold “Page”, then select “Custom”, then select the weatherfax or camera icon. (Video 1 is the engine room, Video 2 is a rear view from the cockpit, Video 3 is the FLIR system.)

4H13: Electronics: Wind Speed & Direction

Hele Mai is equipped with Raymarine wind speed and direction indicators. If turned “On” (with the breaker in the DC panel) operation is entirely automatic. (Photo Above)

4J: Engine & Transmissions

4J1: General Discussion

John Deere instruments: Transmission and Engine Oil Pressure, Voltage, RPM and Water Temperature plus the digital display.

The main engines on the boat are John Deere 4045TFM turbocharged Diesels producing a maximum of 135 horsepower each. These extraordinarily-reliable, rugged machines are top-of-the-line, and can be expected to give you trouble-free, economical cruising.

The engines are controlled at the lower helm with a key, start and stop button; on the flybridge emergency start/stop buttons are provided as well.

On engine start, no long warm-up is required! Three or four minutes is sufficient at idle, then load the engine by putting its transmission in gear.

Do not run it over 1400 RPM until the temperature gauge reads at least 140 degrees Fahrenheit.

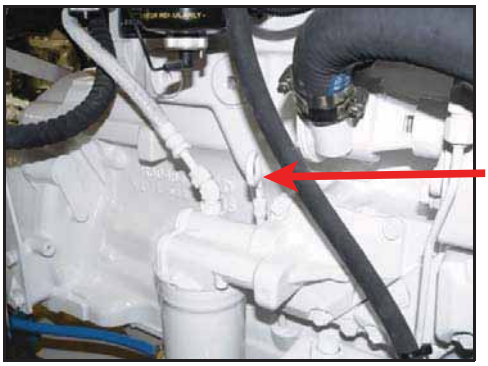
Do not run the engine for long periods with the transmission in neutral, with no load!

Engine Status is shown on the Digital Monitor, an LCD display for each engine at each helm station. Press menu for mode selection, then use the up-down-left-right keys.

4J2: Checking the Engine

The engines require a regular, daily check, since once underway, you will probably not check them while in use, tucked away as they are in the engine room. Please perform this check each morning (when the engine room is cool!):

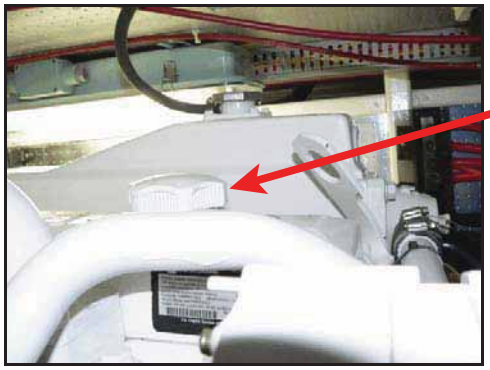
Paper towels are on a holder forward of the starboard engine.



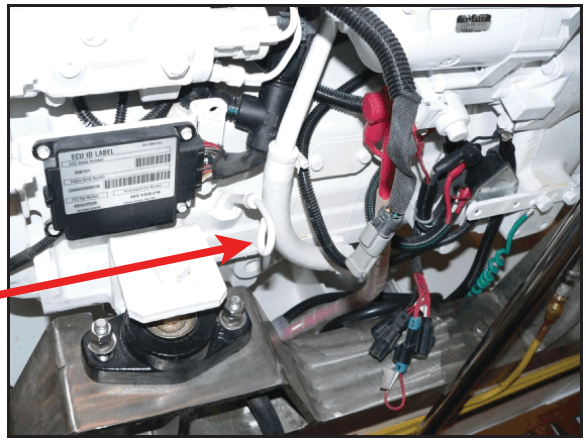
The port engine dipstick just above the oil filter.

CHECK THE OIL. The oil level should be between the two marks on the dipstick located on the top of the engine; the stick "pulls out" upward. Use a paper towel, wipe the stick, reinsert, and take reading. The distance between the two marks is about 1.5 quarts. Add only enough oil to bring it up above the "add" mark, say a quart, using the oil provided on the boat. The oil fill on the engine is a cap on the valve cover of each engine.

After reinserting, be sure to tighten the cap. DO NOT OVERFILL the crankcase (above the "full" mark), as the engine will quickly waste excessive lubricant. If oil is required often, check under the engine carefully to be sure there is no oil leak, and if there is, have it corrected promptly.



Oil fills are in the valve covers of each engine.



Starboard engine dipstick just aft of front motor mount.

Coolant tanks forward of port engine

CHECK THE COOLANT LEVEL. The heat exchanger coolant tanks are located in the engine room on the ceiling forward of the port engine. Underway, these expansion tanks will have coolant in them, and the cap on the heat exchanger on the engines should NOT be opened if coolant shows in the expansion tank. In fact, unless the engine appears to be overheating, or you see evidence in the engine room of a coolant leak, it's probably best to just leave the coolant alone! If coolant is needed, determine if there is any sign of a coolant leak under the engine, and if there is, do not run the engine; if no leak, add coolant from the jug of pre-mixed antifreeze/ corrosion inhibitor/water supplied on the boat. To add coolant, remove the cap on the coolant tank and add coolant from the supply on the boat. With the engine "cold", add only to a level about 1" up from the bottom, no more: The coolant expands when the engine gets warm!

VISUALLY INSPECT THE ROOM whenever you're in the engine room, asking yourself, "Does everything look right?". Look at the pads under the engines and transmissions: while some drips are normal, there shouldn't ever be substantial accumulations of any fluids!

CHECK THE SEA STRAINERS ONCE A WEEK or immediately if any engine (generator or main) runs "hot". The main engine strainers are by the forward end of each engine. The genset strainer is at the aft side of the generator cabinet. To check a strainer, shine a flashlight through it. While some "fuzziness" from trapped thin growth is normal, you should see the light clearly on the other side; if obscured, you should clean the strainer. See page 4.47.

4J3: Engine Controls

The breakers are just left of the bowthruster control.

Hele Mai is fitted with *Morse electronic* engine controls for throttle and shift. They have the following advantages: (1) they are very easy to operate, with no "drag"; and (2) they are trouble-free.

Operation:

Morse Controls. Each handle is a combined transmission shift lever and throttle.

To turn on the controls: Turn on the "Electronic Engine Controls" breakers.

To activate a control station: Open the cover on either control head between the control levers and press the "Select" switch. This activates this control station, and the green "Neutral" lamp will illuminate.

To shift and accelerate engines normally: Moving either/both levers out of their mid-range forward will engine forward ger, then moving them further will accelerate that engine above idle. The orange "Forward" or "Reverse" lamps will illuminate.

To fast-idle an engine: While the control is in neutral with the engine idling, ***press and hold the select button while moving the control lever forward.*** The green "Neutral" lamp will flash, indicating the engine is in neutral in the "fast-Idle" mode.

> ***WARNING: Because it takes little effort to move these controls, and therefore it is easy to apply more throttle than intended especially when maneuvering in the harbor, use your fingertips for throttle operation! Use caution until habituated to their sensitivity.***

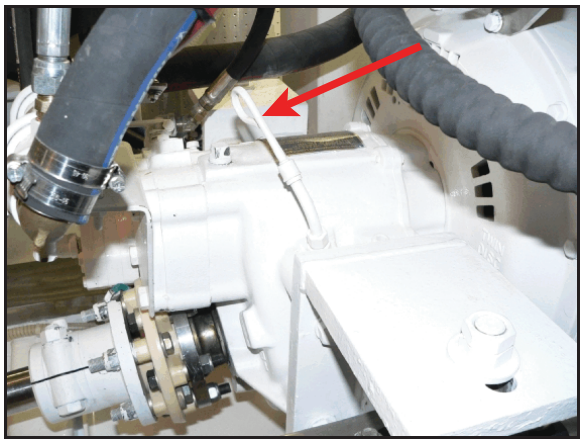
4J4: Engine Operating Parameters

The following parameters are estimated based upon the John Deere 4045TFM operating operating experience and estimated hull performance. ***Full-throttle operation should be less than 15 minutes in an hour;*** Normal maximum cruise is 2300 RPM.

RPM	*Speed*	*Total Fuel Consumption*	*Naut. Miles/Gallon*
1400	6.5	2.8	2.32
1600	7.2	3.6	3.0
1800	8.2	4.2	1.95
2000	9.1	6.5	1.40
2200	9.5	9.5	1.00
2400*	9.9	12.0	.83
2600*	10.5	14.0	.75

** Speeds over 2340 RPM are limited to no more than 20% of operations (no more than one hour in five.)* ***No exceptions!***

4J5: Engine Transmissions



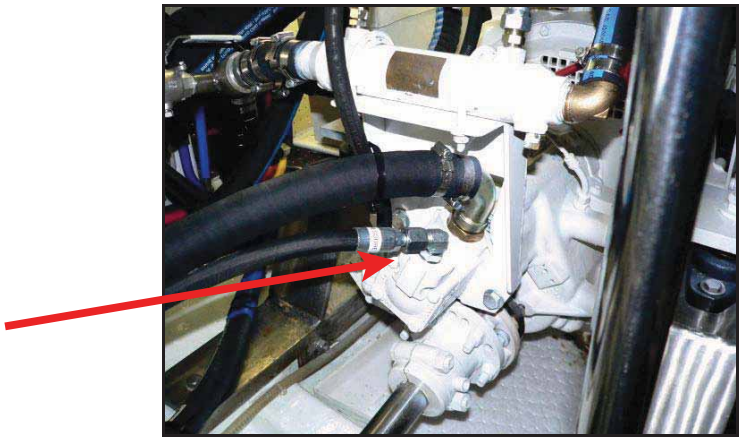
The port transmission. Arrow shows dipstick.

CHECK THE TRANSMISSION OIL LEVELS once every two weeks, more often if a transmission shifts erratically, with the dipstick on the starboard side of each transmission. It is unlikely that any oil will need to be added. Be sure to check under the transmissions for leaks! Low transmission oil is a serious matter.

> *With the engine idling, remove the transmission dipstick. Wipe it with a towel, reinsert it, and take a reading. If the level is below the add mark, stop the engine, add a pint of 30-weight high-quality non-synthetic engine oil through the plug in the top of the transmission case, and then start the engine and measure again. Do not overfill, for to do so could cause the seals to "blow out".*

The transmissions are fitted with oil coolers. Be sure to service the zincs on the coolers when the engines' zincs are serviced.

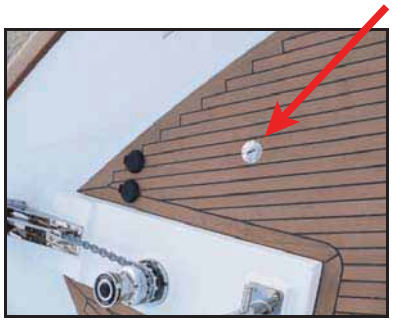
The port transmission is fitted with a hydraulic pump for the Naiad stabilizer system. Check the hose fittings for hydraulic fluid leaks.



The hydraulic pump with its supply (top) and high pressure (bottom) hose lines.

4K: Fresh & Waste Water Systems

4K1: Fresh Water Fill Location



Water fill location.

There is one water tank. The fill for it is on the foredeck just starboard and aft of the anchor windlass.. Stop filling as soon as you hear the water coming up the tank standpipe.

You can check the water level with the gauge on the face of the console in the pilothouse; turn it “On” and set switch to “1".

Be sure to use the "water" fill to port.

A prefilter is stowed in the Portugeuese bridge to allow filtering of the water as you take it aboard when using non-city water sources.

4K2: Fresh Water Heater

Fresh water heater. Blue Pipes are cold fresh water, red pipes are hot fresh water.

After the water pump, water is distributed directly to the cold water faucet lines. In addition, it goes to the boat's water heater in the forward starboard side of the engine room. The heater uses three energy sources, (1) heat from the engine, so that whenever the boat is running, or has recently run, there is hot water; (2) 110 volts AC from shore power or generator, if available and the heaters' 110-volt AC breaker is "on"; (3) Heat from the Everhot unit connected to the Webasto Diesel Furnace. The Everhot is valved into the system by the yellow handle above the hot water heater: If the valve points outboard toward the electric heater, that is the hot water source; if it points aft, the source is the “Everhot” system heated by the Diesel Furnace.

4K3: Fresh Water Pump

The Shur-flo pump is just right of the water heater.

The water line from the tank leads to the boat's fresh water pump located in the engine room to port aft of the engine. Provided the "F.W. Pump" circuit breaker (top switch, right-hand row) is "On", the pump will run whenever its built-in pressure switch detects low water pressure.

It is a good idea to turn off the fresh water pump breaker whenever leaving the boat for any extended period, lest a dripping faucet or broken hose cause the pump to run and waste your precious drinking water.

4K4: Fresh Water Tank Gauge

You can check the water level with the gauge in the head compartment below the holding tank indicator.

Fresh Water Meter

Tank level indicator.

4K5: Fresh Water Meter

A meter that keeps track of how much water remains...it counts down from 240. Reset it when you top the tank.

4K6: Fresh Water Tank

There one fresh water tank holding a total of 250 gallons under the forward staeroom berth. The tank's water flows directly to the freshwater pump.

4K7: Waste Water

Waste water from the sinks and showers (but not from the toilets) is dumped overboard in accordance with U.S. and Canadian law. From sink basins, the water simply flows by gravity overboard. Since the floor of the shower is below the water line, built in shower sump pumps operate to lift this water back above the waterline and dump it overboard.

It is very important that the "sump pump" breaker in the DC panel be left "On".

4K8: Watermaker

Hele Mai is fitted with a Village Marine Watermaker.

The watermaker (above) is in the engine room; the control (right) is in the pilothouse.

This sophisticated unit is seldom required in normal charter use, and we recommend that you do not use it unless absolutely necessary, for incorrect operation can damage the membranes which purify the water.

If circumstances do require its use, follow this basic checklist:;

1. You must have the generator running or be using shore power;
2. Turn on the Low Pressure and High Pressure water valves on the unit in the engine room;
3. Operate the controls so that the unit is running;
4. When the unit is turned off, follow the "reverse flush" procedure.

Full instructions for the watermaker's operation are on pages 31-33 in the Village Marine operating manual kept in the pilothouse port side drawer by the side deck door.

4L: Fuel System

4L1: Fuel System Concept and Introduction

Fuel System Diagrams are on page 4.34 for your reference!

The 800 gallons of Diesel fuel aboard Hele Mai is carried in:

- “forward” tanks of 250 gallons each side of the engine room;
- “aft” tanks of 100 gallons each side of the engine room; and
- a pair of “lazarette tanks” totaling 100 gallons.

This gives the boat great cruising range, but it also means the operator must have some consideration of fuel management in the boat’s operation.

Diesel engines pump an excessive amount of fuel from the tank, injecting enough fuel at high pressure into the engine for its operation, and use the excess to cool the injection pump equipment on the engine. The unused excess is then returned to the tank. For instance, at a given throttle setting for long-range cruising, an engine might be using only two or three gallons per hour, but pumping 15 or 20 gallons through its fuel system. The unused fuel "makes the circuit" through the fuel filters and engine fuel pump, then returns to a fuel tank.

Note: The Lazarette Tanks, though detailed in this manual, are not to be used! The Port Lazarette Tank is empty and the Starboard Lazarette Tank is full for trim purposes and should be left as is!

4L2: Filling the Fuel Tanks

With the six fuel tanks, you need to fuel the boat carefully using standard hose and nozzle (like those on auto gas pumps).

Hint: Splashing water on the decks in the area of each fuel fill (before opening the caps!), then placing an oil-absorbent pad with a hole in it for the filler before filling will help keep any spilled fuel from staining the decks!

Fill all the tanks completely but do not spill fuel! Do not fill the lazarette tanks!

4L3: Fuel Fill Pipe Locations

Fuel fills for the two forward and aft engine room tanks are on the side decks (two per side), while the other two fuel fills for the lazarette tanks are in the cockpit. Take the hose around the boat as necessary to fill all the tanks.

(Above) One of the cockpit fuel fills.
(Right) You can see the mid and forward tank fills on this side deck.

4L4: Fuel Filters

Main engine primary fuel filters are in the engine room, starboard forward corner. Arrow points to valve.

The *primary* fuel filters get larger impurities out of the fuel before it reaches the engine's fuel pump. There are a pair of these primary filters for each main engine The filter in use from each pair is selected by a valve (arrow) on the front of each filter unit.

There is another filter in the engine room for the generator just inboard of that unit.

The *secondary* fuel filter is on the engine itself just before the injection pump system. It is a very fine filter, and is the final protection to be sure the engine's fuel is absolutely clean.

If an engine stops, it is likely a filter is clogged (unless, of course, you've run out of fuel!) Follow engine manual instructions carefully, and remember you may have to prime the engine to re-start it. See the engine manual for this procedure.

4L5: Fuel Management/Tank Valves

(Left) A sight gauge. (Right) The fuel manifold.

In the forward port corner of the engine room there is a fuel manifold consisting of a set of valves for the fuel supply to each main engine and the generator, and another set for the fuel return from these engines back to the ship's tanks. (See "Fuel Manifold" next page).

There are sight gauges on the end of each tank that let you see the level in each. As the fuel level in a pair of tanks gets lower, you can switch the valves so that the return and supply sides connect to another tank.

Unless you want to change the balance of fuel between the tanks, be sure to switch both the supply and return sides of the fuel lines to the manifolds i.e., if you are "getting fuel from the forward tanks, "return it to the forward tanks"!

Failure to have the same tanks both supplying and returning fuel risks spilling fuel as, after a while, the tanks getting the "returned" fuel overflow!

There are also seldom-used valves on each tank itself allowing a tank with contaminated fuel to be isolated from the others.

Note: The Lazarette Tanks, though detailed in this manual, are not to be used! The Port Lazarette Tank is empty and the Starboard Lazarette Tank is full for trim purposes and should be left as is!

4L6: Fuel Manifolds

The Fuel Manifold is located directly in the forward starboard corner of the engine room. The main engines and the generator each have a fuel *supply* and, since extra fuel is pumped to the engine that is used to cool the engines injection pump, there is a fuel *return* line as well. Remember, at slow speeds, these return lines are pumping a lot of fuel; ***you must be careful not to set the valves so that a return line is switched to a tank for long that is not also supplying fuel, lest it overflow and pollute the water through the tank vents' overflowing!***

The diagram to the right shows the fuel manifold, its valves, and the equipment to which the lines are connected.

Example

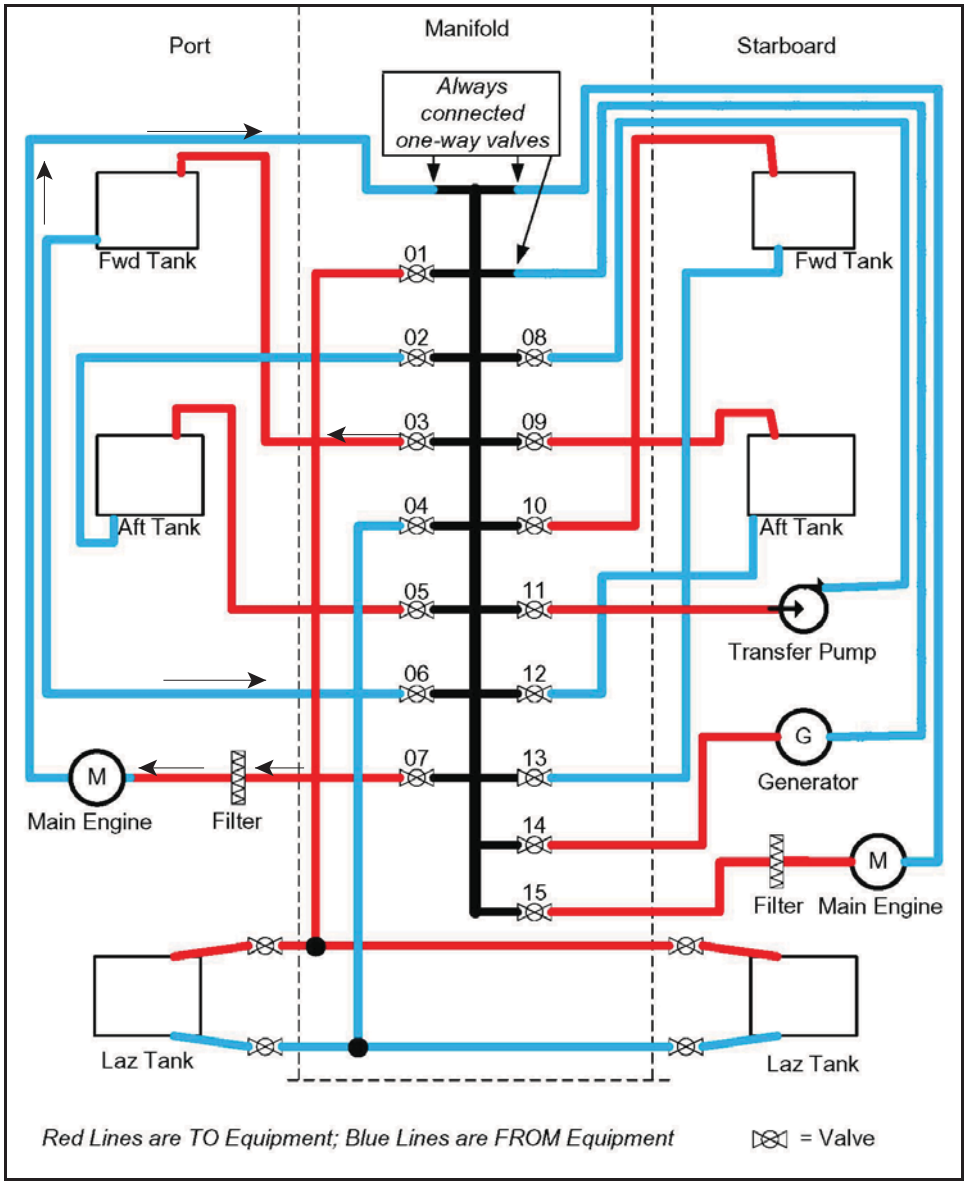
Port Side:

The black arrows show how fuel would flow to the port engine when using the forward tank. The operator opens valves 6, 7 & 3.

The fuel flows:

- *From the forward tank through valve #6;*
- *to valve #7;*
- *to the fuel filter and engine;*
- *back to the manifold;*
- *then back to the tank through #3.*

To accomplish the same result to starboard, the user opens valves 13, 15 and 10.



On the next page are various combinations:

Note: The Lazarette Tanks, though detailed in this manual, are not to be used! The Port Lazarette Tank is empty and the Starboard Lazarette Tank is full for trim purposes and should be left as is!

Valve Number	Purpose
1	Return *TO* both Lazarette Tanks; ***be sure valves in lazarette are open as desired!***
2	Fuel *FROM* Aft Tank in Engine Room
3	Return TO Forward Tank in Engine Room
4	Fuel FROM both Lazarette Tanks; ***be sure valves in lazarette are open as desired!***
5	Return TO Aft Tank in Engine Room
6	Fuel FROM Forward Tank in Engine Room
7	Fuel TO Port Engine
8	Fuel FROM Fuel Transfer Pump
9	Return TO Aft Tank in Engine Room
10	Return TO Forward Tank in Engine Room
11	Fuel TO Fuel Transfer Pump
12	Fuel FROM Aft Engine Room Tank
13	Fuel FROM Forward Tank in Engine Room
14	Fuel TO Generator
15	Fuel TO Starboard Engine

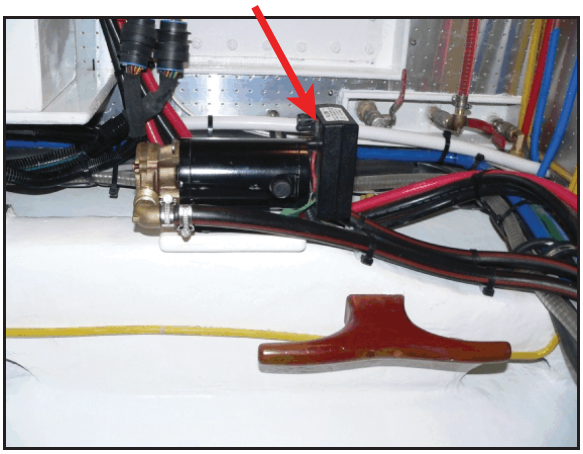
INTENDED ACTION	VALVE DESCRIPTIONS
Run from Forward Tanks	On: Port: 3, 6, 7; Starboard: 10,13,15, Generator: 14
	All others “Off”.
Run from “Engine Room Aft” Tanks	On : Port: 2, 5, 7; Starboard: 9, 12, 15; Generator: 14
	All Others Off
Transfer Fuel Only	Engines & generator off. Transfer pump valves #8 and #11 on. “From” valve on source tank and “To” valve on target tank open.

4L7: Fuel Transfer System

Fuel Transfer

To transfer fuel from one tank to another (very rarely required), set the valves as shown in the table on the preceding page, then turn the pump on (the breaker must be on in the DC power panel). You should watch the progress of the transfer carefully and shut the pump off when the transfer is complete without overfilling the target tank.

Be careful to be sure you don't overfill a tank and cause fuel to be dumped out the tank vent!



The fuel transfer pump is just aft of the fuel manifold to port in the Engine Room. Arrow points to off-on switch.

4L8: Fuel Measurement

There are sight gauges on each tank.

4M: Furnace & Air Conditioning

4M1: Air Conditioning Operation

This view an air conditioning control.

The boat is equipped with an electric *Marine Air* air conditioning and heating System including three compressors. Its outlets are located throughout the boat controlled by thermostats in the saloon and in the master and forward staterooms.

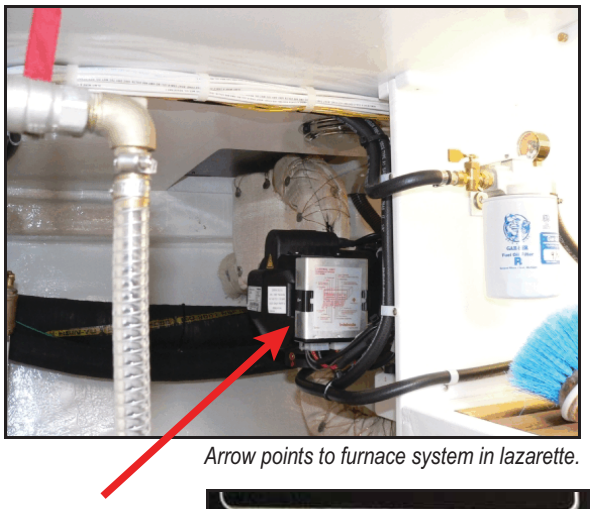
Switches in the AC Breaker Panel allow operation of the system. For operation, you must have either shorepower connected or the generator running, with both the “A/C Pump” and at least one “A/C (Zone)” circuit breakers turned on as required.

Be careful if using a shore power connection not to overload it! The air conditioners' "Mode" setting allows them to heat or cool the vessel, and the thermostats will cycle them on as needed.

The air conditioning control panel has symbols. The red dot/white dot button turns the area on or off. The button with the fan blades symbol regulates fan speed. The red and green thermometers control the temperature. Your settings are shown in the readout, and the led’s show the system’s status.

4M2: Furnace

Concept



Arrow points to furnace system in lazarette.

The boat is equipped with a *Webasto* Diesel circulating hot water heating System. The furnace is in the lazarette to starboard, and heats hot water circulated for heating throughout the boat. In Diesel mode it burns the same fuel as the engine, coming from one of the tanks, using about two quarts/hour. Every day operation is controlled by thermostats to regulate the temperature in (1) the pilothouse; (20) the master stateroom; (3) the guest stateroom; and (4) the saloon. Individual blowers, each with its own “off-low-high” switch then force the air into each area of the boat from small heat exchangers.

The furnace main switch on the power panel.

Operation

To run the furnace: The Webasto main switch on the AC Electric Panel must be on; the green light will be lit. Then, adjust any thermostat to the desired level. The furnace’s built-in computer will warm up the furnace, supply heat until the thermostat senses it is warm enough, then the furnace will go through a “cool-down” cycle. You need not do anything but set the thermostat with the switch “on”!

To control the balance of heat between the boat's areas (particularly the head compartments) use the individual fan control switches by each fan, or open, close, or re-direct the deflectors on the outlets.

The thermostat in the pilothouse.

As you see, this furnace system is flexible! As long as the batteries can support the modest DC requirement of the fans and furnace, you will have plenty of quiet heat. In fact, this use of the house batteries' energy for air circulation is a good reason to limit use of the furnace to times when passengers are awake, unless the boat has shore power available.

Furnace Blower Controls

"Fan Heater" controls are located throughout the boat in areas where there are no thermostats. These will supply heat to that area when the switch is on "Low" or "High" and the furnace is running.

Fan switches are throughout the boat.

4M3: Furnace Exhaust Warning

Note the location of the exhaust aft on the starboard side of the boat! Care should be taken not to black this outlet with fenders or while rafting due to the very high temperature of the exhaust gases from the furnace.

The furnace exhaust is starboard just forward of the swim step.

4M4: Furnace Problems

If battery voltage gets too low the furnace will shut down to avoid running the batteries dead. After the batteries are fully charged, the furnace then should operate.

4M5: Furnace Thermostats

See illustration to right. The buttons control the temperature settings.

Thermostats like this one control the temperature in each area.

4N: Galley & Appliances

Hele Mai *is fitted with a number of appliances for your convenience. Most of these (like the microwave) are easy to operate, "just like a home appliance". But some marine units have some features that are slightly different than home models.*

4N1: Garbage Disposal

A garbage disposal unit is fitted in the left galley sink, with a switch to the right of the faucet. *Use it when discharge rules permit, not in harbors, and only with compostable garbage!*

4N1: Icemaker

The Icemaker, located under the lower helm seat is virtually self-operating, as is the one on the flybridge in the starboard cabinet. It is run by AC power from shore, the genset, or the inverter.

Icemaker in the cockpit cabinet.

Note that if the icemaker is left on for considerable time without the genset or engines running, and the door is opened frequently, it can be a considerable battery load. Monitor the batteries!

Conversely, if the icemaker or refrigerator are left off, you should remove melted ice and frost, and remove food which may spoil.

1) Turn on the Icemaker breaker in the AC breaker panel as needed. The Fresh Water Pump DC breaker must also be on so that the icemaker has sufficient water.
2) Be sure the "arm" in the ice cube tray is down to start making ice.

4N2: Microwave Oven

The microwave is above the stove (photo next page). It operates conventionally.

4N3: Propane Tanks

The boat's propane tanks are under the forward section of the flybridge L-settee. There are two tanks either one of which can be connected to a solenoid electric valve controlled from the galley. To switch tanks, move the connection line (it has a hand-turned fitting).

4N4: Range

The boat is equipped with a *FORCE 10* propane range with three top burners and an oven.

The microwave and stove. Arrow points to stove solenoid-valve switch.

Propane gas is heavier-than-air. Therefore it must be treated with care around a boat so that we can be absolutely sure there is no gas escaping into the atmosphere to collect in the boat's lowest spot, the enclosed bilges, to become an explosive safety hazard. For this reason, the propane tank itself is housed above the galley in the left seat on the flying bridge where any leaked gas will simply blow away.

There is, of course, a manual gas valve on the propane tank used only when exchanging/filling tanks. There is a second valve, a "solenoid valve", in the propane line immediately after the manual valve. This electric valve is controlled by a switch panel in the galley itself; in this way the cook can shut off the propane supply to the stove at its source when it not being used, simply by throwing the switch. In addition, each stove burner including the oven is fitted with a "thermocouple", a heat-sensing device that also controls the gas flow. When the gas supply is "turned on" to a burner, the gas will not flow unless (a) the burner is already on, or (b) the cook is holding the valve in the "light" position. If the burner goes out for any reason, the thermocouple will shut off the fuel automatically, assuring you of a safe galley.

To Light a Burner

Lighting a burner is easy and only takes five to ten seconds:

1) Be sure the propane valve circuit breaker in the DC panel is on.
2) Turn on the remote propane valve on the fly bridge by operating the over-the-stove "Propane" switch (the pilot light on the switch panel will light).
3) Push in the selected burner control knob (all the way) and turn it to high and hold it until the burner lights.
4) After the burner lights, continue to hold the knob in for about 20 seconds after ignition while the thermocouple heats up before adjusting the flame to the desired intensity.
5) If ignition fails, turn off the burner and light it with a match or stove-lighter to be sure that no excessive propane is present.

To Light the Oven

Follow the same procedure as for a burner, above.

Broil with the door open. Don't run the broiler for more than twenty minutes at a time!

4N5: Refrigerator/Freezer - Galley

The boat is equipped with an efficient two-door *Dometic* refrigerator.

The refrigeration runs on 110 volts AC and 12 volts DC and not on the inverter.

Refrigeration temperatures are controlled by the thermostat in the back of the refrigerator; set as required after allowing the refrigerator to stabilize for a few hours after loading. Leave refrigerator control where set as indicated by mark.

4N6: Trash Compactor

The boat is equipped with a trash compacter in the galley under the left side of the sink. To operate it, simply operate the knob. To remove the bag, unhook the front door with the "suitcase latch" on the port side, then swing the front door forward out of the way making bag removal easier.

Use only trash compactor heavy duty bags in the unit.

4N7: Washer and Dryer

Washer/Dryer at foot of stateroom deck steps.

A combined washer-dryer is located in the guest stateroom.

This operates like conventional units, but you should *check the operating manual* for use of the detergent "doors", amount of detergent to use, etc., before use!

Also, be aware that to run the dryer especially you may need to run the generator, as shore power alone often cannot support its heavy electrical current needs. You will need to have the water tanks filled with ample water.

Be sure to clean the filters after each use!

4P: Head Systems

4P1: Overview

The head system on this boat is reliable, straightforward, and easy-to-use.

First, a note about discharge of sewage:

> ***It is forbidden to discharge untreated sewage in inland US. waters, an area that includes all US. waters in which this boat operates. The boat holding tank must only be emptied at proper pump-out stations if it is in US. waters. (This rule does not apply in certain Canadian waters. However, in Canada, courteous practice dictates that the holding tank be dumped only when outside confined marinas.)***

The boat is equipped with a Vacu-Flush Marine head. This has a separate vacuum pump which macerates waste and puts it into a holding tank. The holding tank is emptied either of two ways: by operating an overboard macerator pump controlled at the DC power panel, or by pumping it using a shore side pump out station through the boat's side-deck pump out fitting.

4P2: Head (Toilet)

The premium head is easy to use, odor free, and very reliable. It works with a vacuum pump and vacuum accumulator tank. A vacuum is maintained in the tank until the head is used, when the waste matter in the bowl is sucked out of the head by the vacuum, then it is pumped through the system by the head pump, which then also pumps up a vacuum again. Note that it is this rush of the head's contents caused by the accumulated vacuum that is important to the head's operation! This sudden rush causes any solid material in the waste stream to be shattered as it passes through the specially-shaped orifice in the bottom of the head. For this reason, proper head operation requires that the head pedal not be held down for long periods if time.

The head uses about a half pint of fresh water from the ship's supply with each flush.

4P3: Head Operation

The head is operated by a the pedal to the left of the head base (as you face the head), and operation is as follows:

1) Before using the head if the waste will be solid, lift the pedal to add water to the bowl;
2) Use the head;
3) Step on the pedal just long enough to hear the "whoosh" as the head is evacuated and a small amount of water rinses the bowl - - - about five seconds!
4) Releasing the pedal, if you wish to flush again, wait at least twenty seconds or so (until you hear the head pump stop) before flushing again.

As the pedal is released, the ball-valve at the bottom of the head seals the head so that the vacuum can be pumped up, when the pump will stop, and the head is again ready for use.

Only things which were eaten or drunk or the toilet paper supplied with the boat should be put in the heads! Facial tissues, tampons, and other foreign matter will clog the system. If these heads are used properly, they are very reliable. Failures are virtually always due to mis-use!

There is a plunger under the sink.

4P4: Head Problems

If the holding tank is full, the heads cannot work! Pump the holding tank (see below) when required. Allow time between flushes for the vacuum to be restored (wait til the pump stops!) Hold the pedal down for 3-5 seconds with each flush so enough water is added.

4P5: Holding Tank

There is a 50-gallon holding tank on the boat midships under a hatch in the companionway. The sewage from the head goes to the holding tank.

4P6: Head Holding Tank Level Gauge

The boat is equipped with a tank level indicator in the forward head compartment, so it is easy to tell if a tank is full. Check this indicator regularly and don't flush if full!

4P7: Head Holding Tank Pumpout

If dumped overboard from this tank, the effluent passes through a through-hull valve which is normally in the correct position. To dump the tank, use a shore side pump out station connecting to the "Waste" deck fitting on the deck just forward of trhe starboard pilothouse door.

4P8: Head Waste Overboard Pump

If not in U.S. waters or a "no-discharge zone", you can dump the tank overboard without a pump out station by turning "ON" the macerator pump at the DC panel. Leave it on until you hear the pump run free. This pump is in the forward bilge compartment. Do not leave the pump running dry for long as it will damage the pump!

It takes about 20 minutes to empty a full holding tank. The best way to monitor it is to run it until bubbles come out from under the port side of the hull.

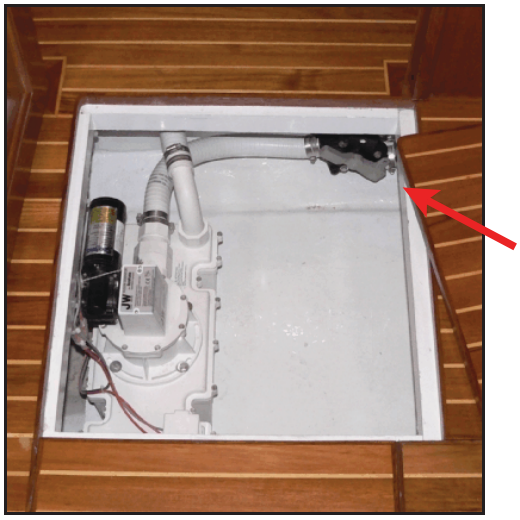
If it is emptied while underway, have someone monitor the operation, checking the tank level indicator to be sure that the pump is not forgotten and left running, lest you ruin the pump!

4P9: Head Y-Valves

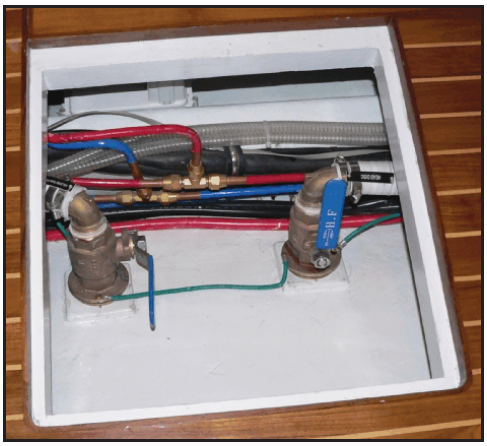
The head is equipped with a Y-valve under the guest stateroom floor. In US. Waters, the Coast Guard Rules require that the valves be "secured" in the holding tank position to assure that all effluent will be kept aboard in the tank. ***Leave the valve wired closed at all times!***

The valve direction is indicated by the handle, which when turned lines up with the direction of flow.

Note: The Coast Guard regulations require the Y-Valves be secured (usually with a wire-tie) in the "Holding Tank" position. If the vessel is boarded, the operator will be cited if this is not so.



The Head Y-Valve. On the left is the head vacuum pump.



The holding tank and head-direct discharge seacocks.

4Q: Running Gear

4Q1: Shaft Seal

The shaft seal.

The vessel is equipped with a dripless shaft seal that is lubricated by water from the engine; the seal should be occasionally checked by the owner to be sure that there is not inappropriate water leakage. Adjustment should be rarely required.

4Q2: Stabilizers:

The boat is equipped with NAIAD stabilizers. Here is the operating checklist for use of the stabilizers.

Read carefully these important warnings:

- ***The stabilizers must be "ON" any time the board moves.***
- ***The stabilizers should be "CENTERED" when the boat is not moving ahead or is adrift or in reverse.***
- ***When the boat is moving forward, the stabilizers can be "ACTIVE" or "CENTERED".***
- ***Should the vessel's relative movement to the water be backward (such as when "surfing" in a following sea) there is danger of broaching and/or at the very least, exaggerated rolling of the vessel, and in these conditions, the fins should be "centered" as below.***
- ***Note that the stabilizers do not protrude underwater beyond the boat's rub rails.***

1) ***Before starting engines,*** turn on "Stabilizer" switch in DC Power Breaker Panel.

   [Do not turn the switch on with the engine already running!] The fins will be in the "Power Up" mode, ready to operate per commands.

2) *Start engines* (the port engine powers the stabilizers' hydraulics.)

   The "lights" pushbutton will illuminate and the fins' positions will be displayed.

3) *Depress the "Center" button to center the fins.*

   The fins will be In the "Center Mode". Keep the fins centered until you have left the harbor and have assumed your cruising speed and are well underway.

4) *Depress the "Active" button to activate the fins. (More next page)*

   The fins will be in the "Active Mode" and will respond as necessary to reduce the vessel's roll.

(More next page...)

Automatic Centering Feature:

If:

(1) the vessel's GPS is working and

(2) the Active button has been depressed and

(3) the "GPS/Signal Bypass" button has **not** been depressed,

... the stabilizers and the system will remain engaged **unless speed drops below a predetermined value.**

If the speed drops below that value, then the stabilizers switch to the "Auto Fins Centering Mode" and they center. The ACTIVE button flashes until the vessel resumes adequate speed, at which time flashing will cease and the fins will be active once again.

That means that the stabilizer operations are automatic unless over-ridden by the operator or the GPS is inoperative.

However, if (1) the vessel's GPS is inoperative, or (2) the "GPS/Signal Bypass Button" is pressed, this automatic feature is inhibited and the "Center" and "Active" buttons must be manually operated. **When either of these conditions is true, care should be exercised to be sure that the fins are centered when not moving forward *through the water* or in heavy following seas!**

Other controls:

The *Roll Angle* control determines how far the fins rotate to correct rolling. The *Roll Rate* control determines how quickly the fins respond to the vessel's rolling motion. Setting either control at the extremes end of its range is usually to be avoided; once set, the stabilizers will self-correct based upon GPS inputs.

Full stabilizer details are in The Naiad Operating manual on the boat.

4Q3: Thruster

Bowthruster control.

Hele Mai is equipped with a bow thruster with a "joystick" control at each helm. This assists you in getting extra close to a dock after you have put the boat within three feet or so using the engine...

To operate the thruster:

- Turn on the thruster by pressing both "on" buttons simultaneously until the lights stay lit;
- Then operate the "joystick" to run the thruster.

The thruster only stays "ON" for about four minutes to protect it from overuse. After it then turns off, you will have to turn it "on" again!

Do not overuse the thruster! Operating it in "jabs" of 10-15 seconds at a time should be enough...it cannot be run for extended times without shutting down when its thermal overload protective relay opens!

The thruster runs from its own 12-volt battery under the forward berth which is charged by the ship's charging system. It's a good idea to run the generator while operating the thruster.

The bow thruster fuse is in the Master Stateroom under the berth.

4R: Safety Equipment

4R1: Safety Equipment Listing

This vessel is equipped with complete safety equipment, detailed on page 1.13

EPIRB

4R2: EPIRB

The boat is equipped with an EPIRB unit to assist in rescue operations.

Never tamper with the unit. It is set for your protection.

It is located next to the radar mast base.

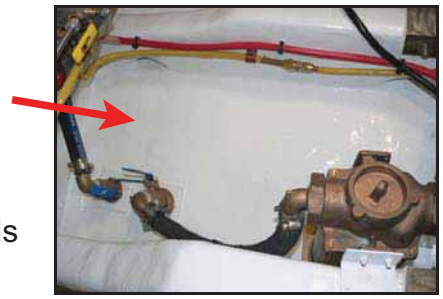
4R3: Defibrillator

The Boat is equipped with a defibrillator in the pilothouse.

4S: Sea Strainers & Through-Hulls

4S1: Sea Strainer Cleaning and Seacocks

The sea strainers on this boat are secure and reliable. They protect the engine, generator, and washdown pump, from water-borne debris which might block internal equipment passages.



One of the engine sea strainers and seacocks.

The easiest way to see if a sea strainer is fouled is to shine a flashlight through it. If you see significant debris, it needs cleaning. If a sea strainer needs cleaning here is the procedure:

1) Follow the hose from the strainer to the valve at the hull. On one side of the valve will be a handle.

2) Turn the valve lever so it is perpendicular to the thru-hull or hose (parallel to the hull).

3) Unscrew the top of the sea strainer. Then remove the strainer by pulling it out the top of the assembly. Rinse the strainer thoroughly and, if necessary, remove any debris from the glass housing.

4) Reinsert the strainer, tighten the top cover and turn the valve back on (in line with the thru-hull itself or its hose).

Failure to re-open the valve after cleaning a sea strainer will overheat the engine or damage the pumps!

This entire operation will take 5-10 minutes at most, and will assure you of properly cool equipment.

4T: Warning Lights & Alarms, Wipers & Washers

4T1: Warning Lights

See the safety panel, page 1.13.

4T2: Windshield Wiper/Washer Controls

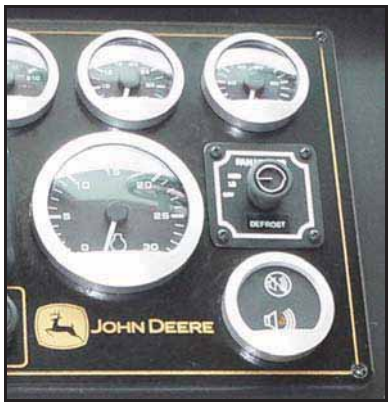
These controls are on the switch panel just forward of the pilothouse helm.

1) There are switches for each of the three windshield wipers.

2) A toggle switch operates the windshield washer.

4T3: Defrosters

The pilothouse windshield is equipped with defrosters that are part of the Webasto furnace system. To use the defroster, the furnace must be on, a thermostat must be up enough for heat, and the control on the port engine control pod in the pilothouse set.



Defroster control on face of lower helm port engine control panel.

Section 5: "What to Do If" for Some Specific Concerns

5A: ANCHOR CHAIN WON'T COME OUT OF CHAIN LOCKER

The anchor chain is continuous, secured at both ends, and cannot tangle. But sometimes a pile of chain will fall over, and one loop of chain will fall through another loop. Usually you can clear this by grasping the chain where it exits the hawse pipe from the chain locker with your hands, and pulling it up or down to "jiggle" the loop out of the chain; you may have to retrieve some chain to do this, in order to have enough slack to jiggle it! It is rare when this will not clear the jam. The other solution: go below and clear the tangle in the chain locker. Caution: Turn off the windlass breaker to protect your hands when manhandling chain!

5B: ANCHOR FOULED, CAN'T RAISE IT

This can happen if you "pull the boat to the anchor" with the windlass. You should move the boat under power until it is over the anchor, or, even better, slightly ahead of it before hauling. Usually this will clear it. Otherwise, take a line and form a fixed, loose loop around the chain. Weight the loop, and lower it down the line until it reaches the bottom, sliding down the chain. Then, using the dinghy, take the line forward past the anchor so that you can pull the anchor out, opposite the direction its flukes are pointing. This should help you to pull the anchor free.

5C: ANCHOR WINDLASS WON'T TURN

If the motor isn't running, is the circuit breaker by the lower helm on? If the motor is running, is the clutch tight? Use the anchor windlass handle. Windlasses are equipped with a shear pin to protect them: if you sheared the pin, you will have to haul the anchor by hand using the emergency handle.

5D: BATTERIES (HOUSE) KEEP RUNNING DOWN

Have you run the engines or generator enough? Is something left on (like the engine room or mast lights, too many electronics, etc.) that is too great a load for the time you were not charging? Are you using the inverter for big jobs? Use the stove or shore power. Have you had the inverter on whenever plugged in to shore power or running the generator? You must, for the house batteries to charge!

5E: ENGINE OVERHEATS

Is the drive belt for the water pump intact? Spare belts are in the engine room spares kit. Is the sea strainer clogged? See that section in this manual. Is the impeller shot? If sea strainer is clear and belt is good, this is likely. Change (spare in spares kit) or call a mechanic. Do not run engine if it overheats!

5F: ENGINE WON'T START

If starter does not turn, is transmission in neutral? Try jiggling shift lever while pushing start button. Check battery, battery switches. Start generator, charge all the batteries. If starter turns, assume fuel problem: did you bump a fuel valve on the manifold at back of engine room? Make sure all open, if one was closed, re-prime engine or call a mechanic if you can't do this (see John Deere engine manual).

5J: HEAD WON'T FLUSH

Is breaker on? Turn it on. Have you over-filled the holding tank? Pump it to allow more effluent to enter it. See the "Heads" section of this manual. If all else fails, just use only the other head.

5K: HIT A FISH NET

Engine in Neutral: don't try to back off, you may foul the net more. Try pulling the boat back with the dinghy & outboard. Get assistance from the fisherman. You are responsible for damage you cause to a net!

5L: HIT A LOG OR ROCK

See EMERGENCY PROCEDURES, next chapter.

5M: PROPELLER FOULED OR DAMAGED

Best thing: have the prop checked by a diver or dive it yourself if able. Check for vibration. Try turning shaft by hand in engine room, both should be turn-able with engine in neutral. Is shaft noisy, or does it load engine? Do not use that side or call Vessel Assist. See emergency procedures, next chapter.

5N: WATER (FRESH) WON'T FLOW

Is there water in the tank? Is F.W. Pump breaker on? If capable, check pressure switch on pump, run manually if necessary. Try Reset Procedure in "Fresh Water System" section 4K5, page 4-36.

Section 6: Emergency Procedures

6A: PROTECT YOUR LIVES FIRST...

Put on life jackets

Contact the Coast Guard with an emergency "MAYDAY" call.

If adrift, prepare to anchor to keep the boat from drifting into danger.

If the boat is really sinking, consider "beaching it" if necessary.

Launch the dinghy and prepare to board if necessary. Take a handheld VHF radio, if available. Be sure to wear life jackets!

6B: ...THEN, WORRY ABOUT THE BOAT!

In a true emergency, you certainly are authorized to call for immediate commercial assistance as minimally required to assure the safety of you and the boat.

It is not an emergency, however, if neither you nor the boat are at risk.

6C: IF YOU THINK IT MAY NOT BE AN EMERGENCY:

If you have any concern about your long-term safety, contact the Coast Guard, either normally or using an urgent "PAN" call. Tell them that you are calling to advise them about your situation, so they can keep in touch.

Be sure that the status and safety of the boat and crew is someone's responsibility while you sort out the boat's problem. For example, delegate your mate to keep a watch for hazards, or to operate the boat on course slowly while you deal with the difficulty.

Here is a checklist for solving the problem:

(A) Isolate it;

(B) Get the manuals;

(C) Get parts;

(D) If necessary, call vendors for help.

Over the years, most problems with boats are caused by misuse! Holding tanks overflow because they aren't checked; heads clog because foreign matter (especially facial tissues and tampons) are put in them; engines fail because they run out of fuel, then must be "purged" to re-start. Use the boat carefully, and you'll avoid these problems.

Almost all problems that are not operator-caused, i.e., that are boat deficiencies, are caused by pumps that fail, hoses and belts that break, and seawater strainers that get clogged. Generally, these problems are annoyances, and usually they are inconvenient, but they still can happen. Try to stay calm, collected, and be a professional by dealing with the problem in a businesslike, calm way. It will make everyone's day a better one!

(Continued on next page)

6D: HITTING A LOG, ROCK, OR DEBRIS ----- PLEASE DON'T!

Hitting a log is a real risk in our Northern waters because logging, and "log rafts," are such a big part of our commerce.

If you hit a log:

- Did you put a hole in the boat? Idle the engine, then think: usually, you can tell just by where the noise of the hit came from. Check the bilges (don't forget the lazarette area, where the rudder posts are) after putting the engine into idle and/or neutral, if necessary.

  If you did "hole" the boat, go immediately to the "If an Emergency" on the preceding pages.

- If no hole, and still idling, is the boat vibrating?

  If "yes," put the engine into neutral, try accelerating it. If there is vibration or any unusual noise (grinding or squealing) shut down that main engine and use the other. Proceed to the closest safe harbor.

- If there is no vibration, you probably did no running gear damage. Congratulations! Have the boat checked by a diver as soon as possible.

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